

# PRELIMINARY DRAINAGE REPORT

FOR

## DOLLAR GENERAL

HIGHWAY 138

Pinon Hills, CA

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## **INTRODUCTION**

### ***LOCATION***

The purpose of this report is to provide a drainage study based on San Bernardino County guidelines for the proposed commercial development (the Site) located in Pinon Hills, San Bernardino County, California. The Site is bounded by Highway 138 to the northeast, Smoke Tree Road (currently a dirt road) to the south, residential lots and undeveloped land to the west and an existing commercial site to the east. Proposed improvements include a 9,100 sq ft commercial retail center, associated parking, utilities and pedestrian access.

### ***SITE DESCRIPTION***

The total property area is approximately 1.78 acres (total area). The current Site is located on undeveloped land. The ground cover is primarily pervious with minimal vegetation and generally slopes to the north and the change in grade over the entire site proposed to be developed is approximately 24'. See Figure 1 below, for a graphical representation of Site location.



### ***FLOODPLAIN DESIGNATION***

This project resides in a Zone “X” area as noted on the FEMA / FIRM Map #06071C6425H, dated August 28, 2008 and is not located in a special flood zone area. A firmette of this map (Figure 2) is attached in **Appendix 1**.

### ***HYDROLOGIC SOIL GROUP***

Based on the Custom Soils Resource Report gathered from the Web Soil Survey online data internet site administrated by the United States Department of Agriculture, the hydrologic soils group associated with the Site is identified as Soil Group A. Excerpts of the Custom Soil Resource Report for the site is included in **Appendix 2**.

### **EXISTING DRAINAGE CONDITIONS**

#### ***ONSITE DRAINAGE CONDITIONS***

Based on available topographic data, most of the onsite runoff drain to the north towards Highway 138. No existing drainage structures are currently available within the property and onsite runoff currently flows without restrictions towards Highway 138.

#### ***OFFSITE DRAINAGE CONDITIONS***

Under current conditions, offsite flows enter the Site along the southern boundary and are generated by the existing dirt road (Smoke Tree Road alignment) and undeveloped land adjacent to the south. For a graphical depiction of the existing drainage conditions, refer to the Drainage Map (Figure 3) included in **Appendix 1**.

### **PROPOSED DRAINAGE CONDITIONS**

The new development proposes an increase in impervious area. As a result the runoff generated onsite will increase. The Project will provide a detention surface ponds to account for the difference in pre vs. post discharge rates for the 10, 25 and 100 year storm events. The proposed detention ponds will also serve as a stormwater quality treatment structure by trapping all sediments and oils generated by the commercial development. Proposed detention ponds will be



1 foot deep graded with 4 to 1 side slopes. Current drainage patterns will be maintained under post-development conditions.

Precipitation frequency estimates from the 10, 25 and 100 year storm events were used to develop an I-D-F curve data file used in the Hydraflow Hydrograph Extension in Civil3D. Precipitation data for the design storm events have been provided by The National Oceanic and Atmospheric Administration (NOAA) Atlas 14, refer to **Appendix 2**.

### ***ONSITE DRAINAGE CONDITIONS***

The onsite rainfall runoff will be routed via surface sheet-flow along concrete gutters or asphalt pavement and onsite asphalt pavement has been designed to have a minimum slope of 1% to avoid localized ponding. Collected on-site runoff will be conveyed to a surface detention ponds sized to attenuate increased flows associated with the proposed improvements. The proposed surface detention ponds will be provided with a dual purpose storm drain pipes proposed as means of discharge control and as a pond bleed-off structure.

Based on the proposed grading, the site has been divided in three drainage areas identified in this report as DA-1, DA-2 and DA-3. Refer to **Appendix 1** for drainage exhibit.

Drainage area DA-1 includes the parking located and sidewalk located to the west of the proposed commercial building. Proposed detention pond POND-1 will be located along the western property boundary and will be provided with a weir designed to control the peak flow discharge in combination with a 12-inch storm drain pipe designed to restrict the peak flow discharge and to serve as a bleed-off pipe for dewatering purposes.

Drainage area DA-2 includes the proposed commercial building and the parking lot area adjacent to the north. Proposed detention pond POND-2 will be located along the northeast property boundary. The similarly as POND-1, detention basin POND-2 will be provided with weir outlet combined with a bleed off pipe for peak flow control and dewatering purposes.

Lastly, drainage area DA-3 includes the proposed driveway connecting the proposed development with the existing adjacent Highway 138. Due to topographic constraints drainage area DA-3 will not be retained and will be graded to discharge peak flow to the north towards Highway 138. The overall peak flow attenuation provided by detention ponds POND-1 and POND-2 has been designed to compensate the lack of drainage area DA-3 peak flow attenuation.

All hydrologic calculations were performed using the Rational Method with Hydraflow Hydrograph, an extension for Civil3D 2013. Criteria pertaining hydrologic calculations presented in this report are based on guidelines described in the San Bernardino County Hydrology Manual.

Runoff coefficients (C) were calculated based on Hydrologic Manual for San Bernardino County Equation D.3. The following summary table presents the results based on the criteria described in Section D.

$$C=0.90 [ a_i + (( I - F_p ) a_p / I)] \dots\dots\dots (\text{San Bernardino County Equation D.3})$$

- Where;
- C = runoff coefficient
  - I = rainfall intensity (inches/hour)
  - Fp = infiltration rate for pervious area (inches/hour)
  - a<sub>i</sub> = ration of impervious area to total area (decimal fraction)
  - a<sub>p</sub> = ration of pervious area to total area (decimal fraction), (a<sub>p</sub> = 1 - a<sub>i</sub> )

Assumptions for this calculations include a CN value of 98 for developed conditions with a corresponding Fp value of 0.01 and a CN value of 56 for undeveloped conditions with a corresponding Fp value of 0.42. The intensity “I” assumed for this calculations is 3.8 in/hr based on NOAA Atlas 14 precipitation data for the 100-year, 5 minute storm event. Refer to **Appendix 4** for related San Bernardino Hydrologic Manual figures.

<b>Pre-Development Conditions</b>	<b>Post-Development Conditions</b>		
<b>OVERALL</b>	<b>DA-1</b>	<b>DA-2</b>	<b>DA-3</b>
ai = 0 /41,461	ai = 12,173 /13,365	ai = 16,781 /19,770	ai = 8,326 /8,326
ai = 0	ai = 0.91	ai = 0.85	ai = 1
ap = 1	ap = 0.09	ap = 0.15	ap = 0
<b>C=0.80</b>	<b>C=0.90</b>	<b>C=0.90</b>	<b>C=0.90</b>

Due to the nature of Pre vs Post analysis and as a conservative measure this report assumes a C value of 0.70 for pre-development conditions and 0.95 for post-development conditions in order to increase the gap between Pre and Post C values and to ultimately increase the detention volumes required to attenuate the increased peak flow associated with the proposed commercial development.

Based on the size of the drainage areas and as an additional conservative measure an assumed time of concentration (Tc) equal to 5 minutes for pre-development and post-development conditions has been assumed for hydrologic calculations. Refer to **Appendix 5** for hydrologic calculations.

### ***HYDRAULIC CALCULATIONS***

All hydraulic calculations were performed using Hydraflow Hydrograph an extension for Civil3D 2013. Proposed detention ponds have been sized attenuate the increased peak flow associated with the commercial improvements. The following summary table presents a breakdown of peak flows calculated as part of the Pre vs Post analysis. Refer to **Appendix 5** for hydraulic calculations and 10-year and 25-year storm peak flows.

Drainage area ID	100-year Storm Peak Flow (cfs)		Detention Pond Data		
	Pre	Post			
Existing Overall	2.519	----	ID	Max Storage (cf)	Peak Flow (cfs)
DA-1	----	1.102	POND-1	234	0.469
DA-2	----	1.630	POND-2	436	0.307
DA-3	----	0.686	----		----

### ***OFFSITE DRAINAGE CONDITIONS***

Offsite runoff entering the site along the southern property boundary is proposed to be rerouted around the building with a combination of a berm and drainage swale located along the southern boundary and designed to convey the flow to the historic drainage pattern. The proposed swale will be 1 foot deep with 2 to 1 side slopes and a minimum longitudinal slope equal to 1.5%. A capacity calculation based on the swales specifications is included in **Appendix 5**.

For a graphical depiction of the proposed drainage conditions, refer to the Drainage Map (Figure 3) included in **Appendix 1**.

## **CONCLUSIONS**

The Project will provide a detention surface ponds to account for the difference in pre vs. post discharge rates for the 10, 25 and 100 year storm events. No adverse impacts to the offsite properties are anticipated as a result of the proposed improvements. Existing drainage patterns will be preserve under pre-development conditions.

## **REFERENCES**

*San Bernardino County*, County of San Bernardino Hydrology Manual Addendum for Arid Regions, April 2010.

*San Bernardino County*, Hydrology Manual, August 1986.

*National Oceanographic and Atmospheric Administration*, NOAA ATLAS 14, Volume 6, Version 2, 2015

*U.S. Geological Survey*, Hydrology Scientific Investigations Map SIM-3062, 2009.


## **Appendix 1: Figures**





FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE SAN BERNARDINO COUNTY

National Flood Insurance Program at 1-800-638-6620.



MAP SCALE 1" = 2000'

0000

0

2000

4000

FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 6425H

FIRM

FLOOD INSURANCE RATE MAP

SAN BERNARDINO COUNTY, CALIFORNIA AND INCORPORATED AREAS


PANEL 6425 OF 9400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN BERNARDINO COUNTY	060270	6425	H

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER

06071C6425H

MAP REVISED

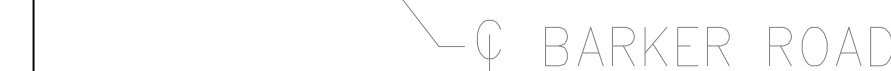
AUGUST 28, 2008

Federal Emergency Management Agency

FIGURE 2 - FIRMETTE DG - PINON HILLS

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)





### GRAPHIC SCALE

## 0.806

DRAINAGE BOUNDARY

F-3

## **Appendix 2: USDA Custom Soil Resource Report (Excerpts)**





United States  
Department of  
Agriculture

**NRCS**

Natural  
Resources  
Conservation  
Service

A product of the National  
Cooperative Soil Survey,  
a joint effort of the United  
States Department of  
Agriculture and other  
Federal agencies, State  
agencies including the  
Agricultural Experiment  
Stations, and local  
participants

# Custom Soil Resource Report for San Bernardino County, California, Mojave River Area

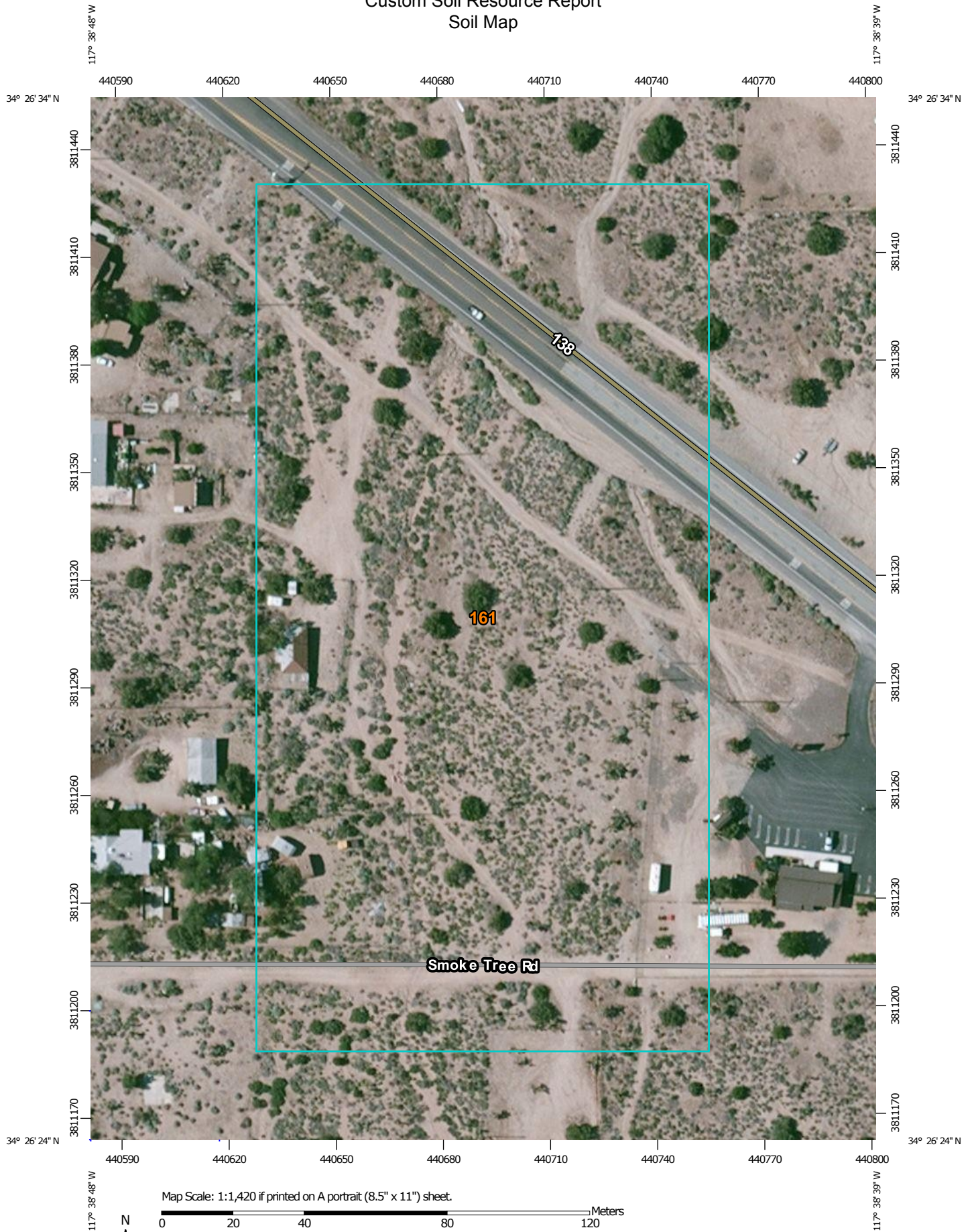
## DG Pinon Hills



August 11, 2015



# Custom Soil Resource Report Soil Map



Map Scale: 1:1,420 if printed on A portrait (8.5" x 11") sheet.

0 20 40 80 120 Meters

0 50 100 200 300 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

# Custom Soil Resource Report


## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features

 Blowout

 Borrow Pit

 Clay Spot


 Closed Depression

 Gravel Pit

 Gravelly Spot


 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water


 Perennial Water

 Rock Outcrop


 Saline Spot

 Sandy Spot

 Severely Eroded Spot


 Sinkhole


 Slide or Slip


 Sodic Spot

 Spoil Area

 Stony Spot


 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

### Water Features

 Streams and Canals


### Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County, California, Mojave River Area  
Survey Area Data: Version 7, Sep 8, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 25, 2010—Oct 29, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

San Bernardino County, California, Mojave River Area (CA671)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
161	SOBOBA GRAVELLY SAND, COOL, 2 TO 9 PERCENT SLOPES	7.6	100.0%
<b>Totals for Area of Interest</b>		<b>7.6</b>	<b>100.0%</b>

## Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

## Custom Soil Resource Report

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.



## San Bernardino County, California, Mojave River Area

### 161—SOBOBA GRAVELLY SAND, COOL, 2 TO 9 PERCENT SLOPES

#### Map Unit Setting

*National map unit symbol:* hkt3  
*Elevation:* 30 to 4,200 feet  
*Mean annual precipitation:* 3 to 6 inches  
*Mean annual air temperature:* 59 to 63 degrees F  
*Frost-free period:* 180 to 280 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Soboba and similar soils:* 85 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Soboba

##### Setting

*Landform:* Fan aprons  
*Landform position (two-dimensional):* Footslope  
*Landform position (three-dimensional):* Tread  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from granite

##### Typical profile

*H1 - 0 to 4 inches:* gravelly sand  
*H2 - 4 to 60 inches:* stratified very cobbly sand to very gravelly loamy sand

##### Properties and qualities

*Slope:* 2 to 9 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Excessively drained  
*Capacity of the most limiting layer to transmit water (Ksat):* Very high (19.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* Occasional  
*Frequency of ponding:* None  
*Available water storage in profile:* Very low (about 1.8 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 7w  
*Hydrologic Soil Group:* A  
*Ecological site:* COARSE LOAMY (R030XE006CA)

#### Minor Components

##### Tujunga

*Percent of map unit:* 5 percent

##### Hanford

*Percent of map unit:* 5 percent

### **Appendix 3: NOAA 14 Precipitation Values**



## POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps & aeriels](#)

### PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.936 (0.780–1.14)	1.28 (1.07–1.57)	1.78 (1.46–2.17)	2.20 (1.80–2.71)	2.80 (2.22–3.58)	3.29 (2.54–4.28)	3.80 (2.87–5.08)	4.34 (3.19–5.98)	5.12 (3.61–7.34)	5.74 (3.90–8.52)
10-min	0.672 (0.552–0.816)	0.924 (0.762–1.13)	1.27 (1.05–1.56)	1.57 (1.29–1.94)	2.00 (1.59–2.56)	2.35 (1.82–3.07)	2.72 (2.06–3.64)	3.11 (2.29–4.28)	3.67 (2.59–5.26)	4.11 (2.80–6.10)
15-min	0.540 (0.448–0.656)	0.744 (0.616–0.908)	1.03 (0.848–1.26)	1.27 (1.04–1.56)	1.62 (1.28–2.06)	1.90 (1.47–2.48)	2.20 (1.66–2.94)	2.51 (1.84–3.46)	2.96 (2.08–4.24)	3.31 (2.25–4.92)
30-min	0.386 (0.320–0.470)	0.530 (0.440–0.648)	0.734 (0.606–0.898)	0.906 (0.742–1.12)	1.16 (0.914–1.47)	1.36 (1.05–1.77)	1.57 (1.19–2.10)	1.79 (1.32–2.47)	2.11 (1.49–3.03)	2.37 (1.61–3.51)
60-min	0.269 (0.223–0.328)	0.370 (0.307–0.452)	0.512 (0.423–0.627)	0.632 (0.517–0.780)	0.806 (0.638–1.03)	0.946 (0.733–1.23)	1.10 (0.827–1.46)	1.25 (0.920–1.72)	1.47 (1.04–2.11)	1.65 (1.12–2.45)
2-hr	0.196 (0.162–0.240)	0.267 (0.221–0.326)	0.365 (0.301–0.446)	0.448 (0.367–0.553)	0.568 (0.449–0.724)	0.664 (0.514–0.866)	0.766 (0.578–1.02)	0.873 (0.642–1.20)	1.02 (0.721–1.47)	1.14 (0.778–1.70)
3-hr	0.163 (0.135–0.199)	0.220 (0.182–0.269)	0.299 (0.246–0.366)	0.366 (0.299–0.452)	0.462 (0.365–0.589)	0.539 (0.418–0.703)	0.620 (0.469–0.829)	0.707 (0.519–0.972)	0.828 (0.583–1.19)	0.924 (0.629–1.37)
6-hr	0.118 (0.098–0.143)	0.157 (0.130–0.192)	0.212 (0.175–0.260)	0.258 (0.211–0.319)	0.324 (0.257–0.414)	0.377 (0.292–0.492)	0.433 (0.327–0.579)	0.492 (0.362–0.677)	0.575 (0.405–0.825)	0.641 (0.436–0.953)
12-hr	0.079 (0.065–0.096)	0.107 (0.088–0.130)	0.145 (0.120–0.178)	0.178 (0.145–0.219)	0.223 (0.177–0.285)	0.260 (0.201–0.339)	0.298 (0.225–0.398)	0.338 (0.248–0.465)	0.394 (0.277–0.565)	0.438 (0.298–0.651)
24-hr	0.053 (0.047–0.061)	0.073 (0.065–0.084)	0.101 (0.089–0.117)	0.124 (0.109–0.145)	0.157 (0.133–0.189)	0.183 (0.152–0.225)	0.210 (0.170–0.264)	0.238 (0.188–0.309)	0.278 (0.210–0.376)	0.310 (0.226–0.433)
2-day	0.031 (0.028–0.036)	0.044 (0.039–0.051)	0.062 (0.054–0.071)	0.076 (0.067–0.089)	0.097 (0.082–0.117)	0.113 (0.094–0.139)	0.130 (0.106–0.164)	0.148 (0.117–0.192)	0.173 (0.131–0.234)	0.193 (0.141–0.270)
3-day	0.022 (0.020–0.026)	0.032 (0.028–0.037)	0.045 (0.040–0.052)	0.056 (0.049–0.065)	0.072 (0.061–0.086)	0.084 (0.070–0.103)	0.097 (0.078–0.122)	0.110 (0.087–0.143)	0.129 (0.098–0.174)	0.144 (0.105–0.201)
4-day	0.018 (0.016–0.020)	0.026 (0.023–0.029)	0.036 (0.032–0.042)	0.045 (0.040–0.053)	0.058 (0.049–0.070)	0.068 (0.057–0.084)	0.079 (0.064–0.099)	0.090 (0.071–0.117)	0.106 (0.080–0.143)	0.118 (0.086–0.165)
7-day	0.011 (0.010–0.013)	0.016 (0.014–0.019)	0.023 (0.020–0.027)	0.029 (0.026–0.034)	0.038 (0.032–0.045)	0.045 (0.037–0.055)	0.052 (0.042–0.065)	0.059 (0.047–0.077)	0.070 (0.053–0.094)	0.078 (0.057–0.109)
10-day	0.008 (0.007–0.009)	0.012 (0.010–0.014)	0.017 (0.015–0.020)	0.022 (0.019–0.025)	0.028 (0.024–0.034)	0.033 (0.028–0.041)	0.039 (0.031–0.049)	0.045 (0.035–0.058)	0.053 (0.040–0.071)	0.059 (0.043–0.083)
20-day	0.005 (0.004–0.005)	0.007 (0.006–0.008)	0.010 (0.009–0.012)	0.013 (0.011–0.015)	0.017 (0.015–0.021)	0.021 (0.017–0.025)	0.024 (0.020–0.031)	0.028 (0.022–0.036)	0.034 (0.025–0.045)	0.038 (0.028–0.053)
30-day	0.003 (0.003–0.004)	0.005 (0.005–0.006)	0.008 (0.007–0.009)	0.010 (0.009–0.012)	0.013 (0.011–0.016)	0.016 (0.013–0.020)	0.019 (0.016–0.024)	0.022 (0.018–0.029)	0.027 (0.020–0.036)	0.030 (0.022–0.043)
45-day	0.003 (0.002–0.003)	0.004 (0.004–0.005)	0.006 (0.005–0.007)	0.008 (0.007–0.009)	0.011 (0.009–0.013)	0.013 (0.011–0.016)	0.015 (0.012–0.019)	0.018 (0.014–0.023)	0.022 (0.016–0.029)	0.025 (0.018–0.034)
60-day	0.002 (0.002–0.003)	0.003 (0.003–0.004)	0.005 (0.004–0.006)	0.007 (0.006–0.008)	0.009 (0.007–0.011)	0.011 (0.009–0.013)	0.013 (0.010–0.016)	0.015 (0.012–0.019)	0.018 (0.014–0.024)	0.021 (0.015–0.029)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

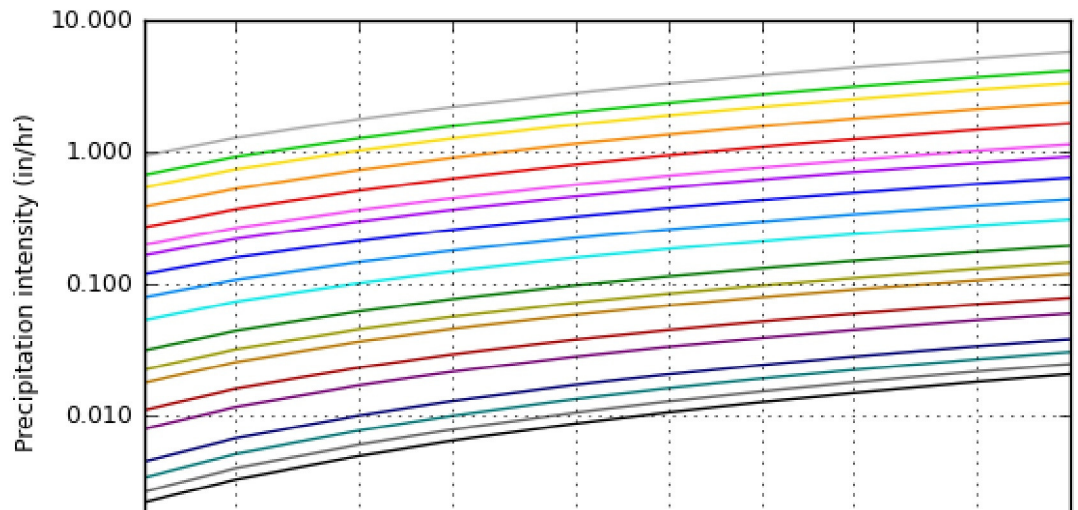
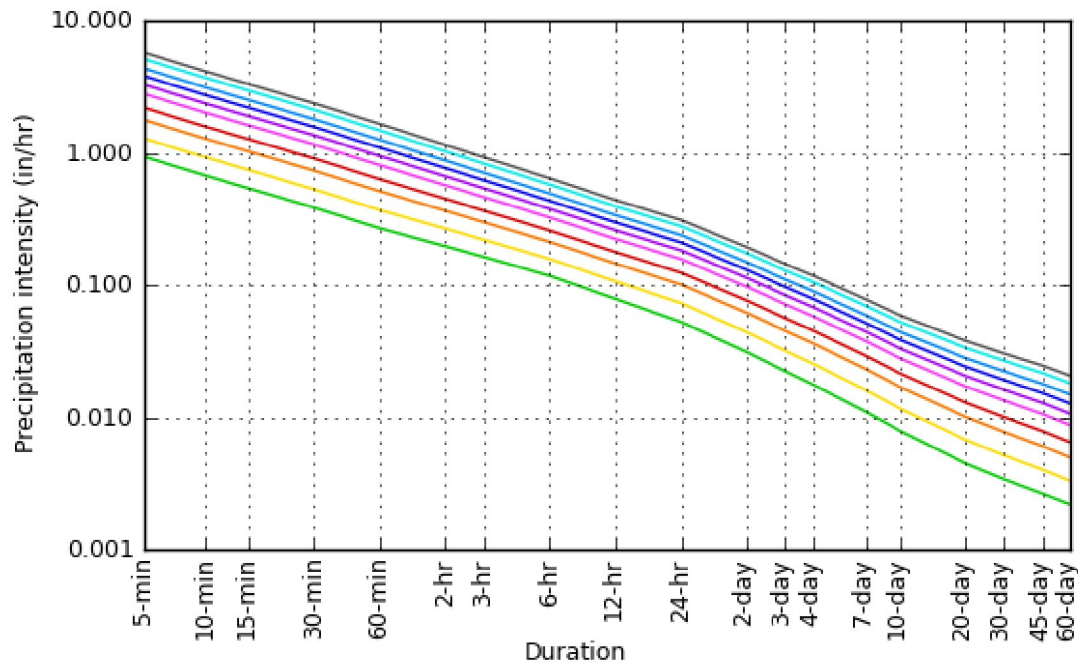
Please refer to NOAA Atlas 14 document for more information.

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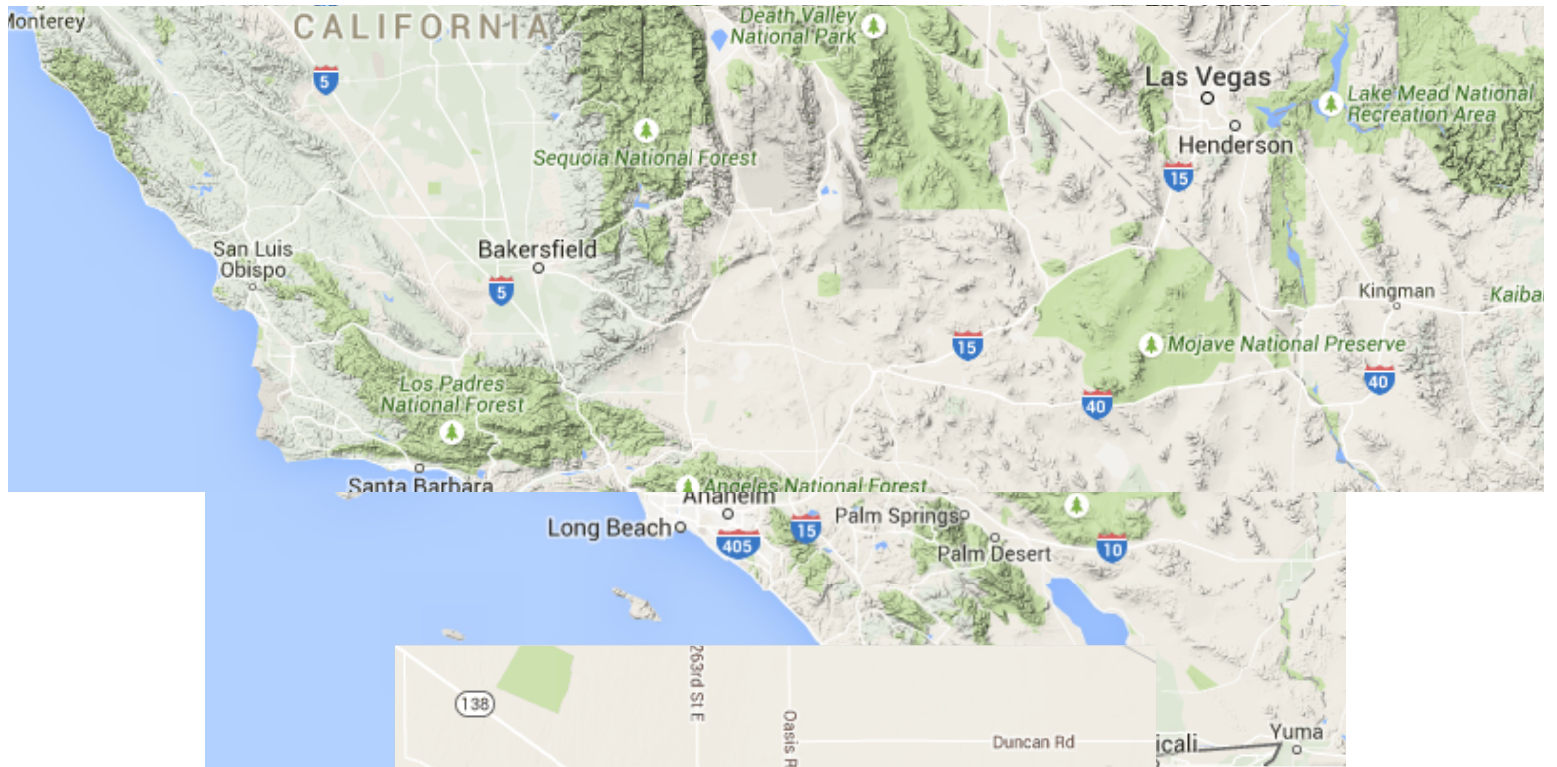
# PF graphical

## PDS-based intensity-duration-frequency (IDF) curves

Latitude: 34.4417°, Longitude: -117.6456°







**Large scale map**



**Large scale aerial**





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## POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnini, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aeriels](#)

### PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.078 (0.065–0.095)	0.107 (0.089–0.131)	0.148 (0.122–0.181)	0.183 (0.150–0.226)	0.233 (0.185–0.298)	0.274 (0.212–0.357)	0.317 (0.239–0.423)	0.362 (0.266–0.498)	0.427 (0.301–0.612)	0.478 (0.325–0.710)
10-min	0.112 (0.092–0.136)	0.154 (0.127–0.188)	0.212 (0.175–0.260)	0.262 (0.215–0.324)	0.334 (0.265–0.427)	0.392 (0.304–0.512)	0.454 (0.343–0.607)	0.519 (0.382–0.714)	0.612 (0.431–0.877)	0.685 (0.466–1.02)
15-min	0.135 (0.112–0.164)	0.186 (0.154–0.227)	0.257 (0.212–0.314)	0.317 (0.260–0.391)	0.404 (0.320–0.516)	0.474 (0.368–0.619)	0.549 (0.415–0.734)	0.628 (0.461–0.864)	0.740 (0.521–1.06)	0.828 (0.563–1.23)
30-min	0.193 (0.160–0.235)	0.265 (0.220–0.324)	0.367 (0.303–0.449)	0.453 (0.371–0.559)	0.578 (0.457–0.737)	0.678 (0.525–0.884)	0.784 (0.593–1.05)	0.897 (0.659–1.23)	1.06 (0.744–1.52)	1.18 (0.805–1.76)
60-min	0.269 (0.223–0.328)	0.370 (0.307–0.452)	0.512 (0.423–0.627)	0.632 (0.517–0.780)	0.806 (0.638–1.03)	0.946 (0.733–1.23)	1.10 (0.827–1.46)	1.25 (0.920–1.72)	1.47 (1.04–2.11)	1.65 (1.12–2.45)
2-hr	0.393 (0.325–0.479)	0.534 (0.442–0.652)	0.730 (0.602–0.893)	0.896 (0.734–1.11)	1.14 (0.898–1.45)	1.33 (1.03–1.73)	1.53 (1.16–2.05)	1.75 (1.28–2.40)	2.05 (1.44–2.94)	2.29 (1.56–3.40)
3-hr	0.490 (0.406–0.597)	0.661 (0.547–0.807)	0.897 (0.740–1.10)	1.10 (0.899–1.36)	1.39 (1.10–1.77)	1.62 (1.25–2.11)	1.86 (1.41–2.49)	2.12 (1.56–2.92)	2.49 (1.75–3.57)	2.78 (1.89–4.12)
6-hr	0.705 (0.584–0.859)	0.943 (0.781–1.15)	1.27 (1.05–1.55)	1.55 (1.27–1.91)	1.94 (1.54–2.48)	2.26 (1.75–2.95)	2.59 (1.96–3.47)	2.95 (2.17–4.05)	3.45 (2.43–4.94)	3.84 (2.61–5.70)
12-hr	0.949 (0.786–1.16)	1.29 (1.07–1.57)	1.75 (1.45–2.14)	2.14 (1.75–2.64)	2.69 (2.13–3.44)	3.13 (2.42–4.08)	3.59 (2.71–4.80)	4.07 (2.99–5.60)	4.75 (3.34–6.81)	5.28 (3.59–7.84)
24-hr	1.26 (1.12–1.45)	1.75 (1.55–2.02)	2.42 (2.14–2.80)	2.98 (2.61–3.47)	3.76 (3.19–4.53)	4.39 (3.64–5.39)	5.04 (4.08–6.35)	5.72 (4.51–7.41)	6.68 (5.05–9.02)	7.44 (5.43–10.4)
2-day	1.50 (1.33–1.72)	2.11 (1.87–2.44)	2.96 (2.61–3.42)	3.67 (3.21–4.27)	4.66 (3.94–5.61)	5.44 (4.51–6.69)	6.26 (5.07–7.89)	7.13 (5.61–9.23)	8.33 (6.30–11.2)	9.28 (6.78–13.0)
3-day	1.61 (1.43–1.85)	2.30 (2.03–2.65)	3.25 (2.87–3.75)	4.04 (3.54–4.71)	5.15 (4.37–6.21)	6.04 (5.01–7.42)	6.96 (5.63–8.76)	7.93 (6.25–10.3)	9.29 (7.02–12.5)	10.4 (7.58–14.5)
4-day	1.70 (1.51–1.96)	2.45 (2.17–2.83)	3.49 (3.08–4.04)	4.36 (3.82–5.08)	5.59 (4.73–6.73)	6.55 (5.44–8.06)	7.57 (6.13–9.54)	8.64 (6.81–11.2)	10.1 (7.67–13.7)	11.3 (8.28–15.9)
7-day	1.86 (1.65–2.14)	2.71 (2.40–3.12)	3.90 (3.44–4.51)	4.91 (4.30–5.72)	6.34 (5.37–7.64)	7.48 (6.21–9.20)	8.67 (7.02–10.9)	9.94 (7.83–12.9)	11.7 (8.85–15.8)	13.1 (9.57–18.3)
10-day	1.91 (1.69–2.20)	2.81 (2.49–3.24)	4.09 (3.61–4.73)	5.18 (4.54–6.04)	6.75 (5.72–8.12)	7.99 (6.63–9.83)	9.30 (7.54–11.7)	10.7 (8.42–13.9)	12.7 (9.57–17.1)	14.2 (10.4–19.9)
20-day	2.16 (1.92–2.49)	3.26 (2.89–3.76)	4.85 (4.28–5.61)	6.23 (5.45–7.26)	8.24 (6.99–9.93)	9.89 (8.20–12.2)	11.6 (9.42–14.7)	13.5 (10.6–17.5)	16.1 (12.2–21.8)	18.2 (13.3–25.5)
30-day	2.46 (2.18–2.83)	3.73 (3.30–4.30)	5.60 (4.94–6.47)	7.24 (6.34–8.44)	9.68 (8.20–11.7)	11.7 (9.68–14.4)	13.8 (11.2–17.4)	16.1 (12.7–20.8)	19.3 (14.6–26.1)	21.9 (16.0–30.6)
45-day	2.88 (2.55–3.32)	4.37 (3.87–5.03)	6.56 (5.79–7.58)	8.52 (7.46–9.93)	11.5 (9.72–13.8)	13.9 (11.6–17.1)	16.5 (13.4–20.8)	19.4 (15.3–25.1)	23.4 (17.7–31.6)	26.7 (19.5–37.2)
60-day	3.19 (2.82–3.67)	4.79 (4.24–5.52)	7.19 (6.35–8.32)	9.36 (8.20–10.9)	12.6 (10.7–15.2)	15.4 (12.8–18.9)	18.3 (14.9–23.1)	21.5 (16.9–27.9)	26.1 (19.7–35.2)	29.8 (21.7–41.6)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

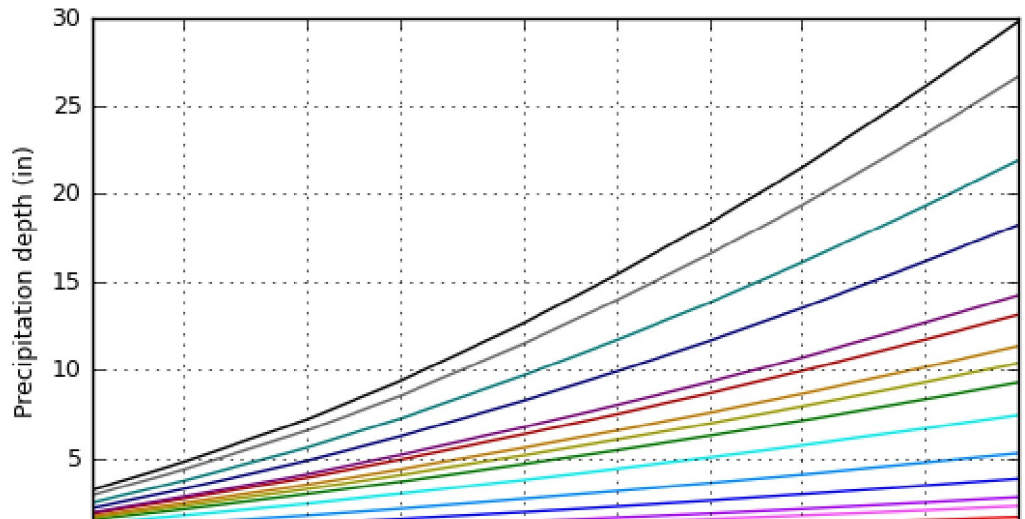
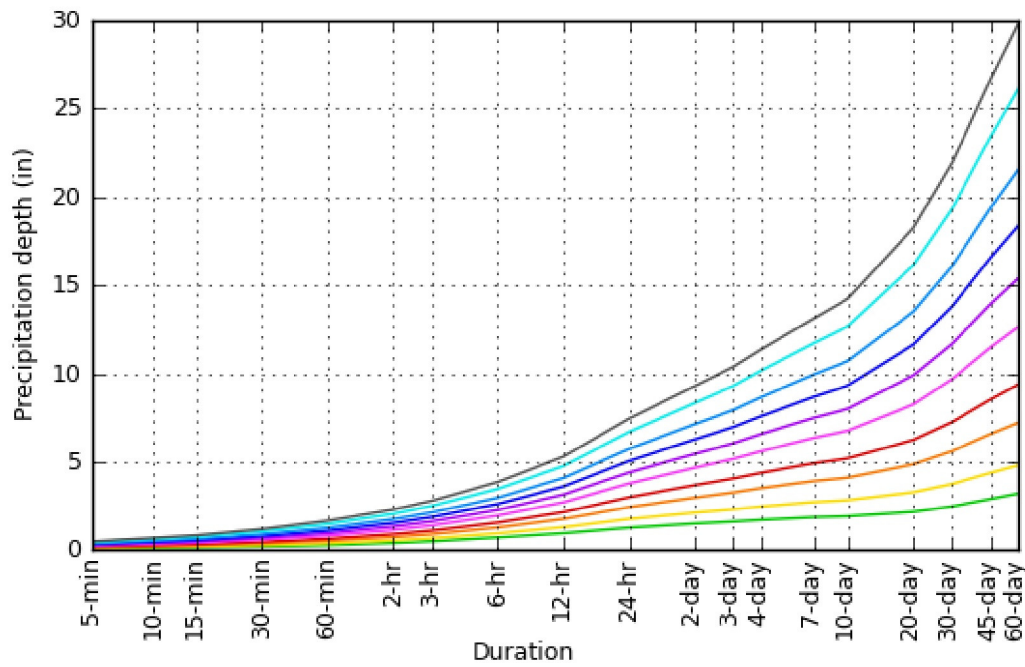
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# PF graphical

## PDS-based depth-duration-frequency (DDF) curves

Latitude: 34.4417°, Longitude: -117.6456°

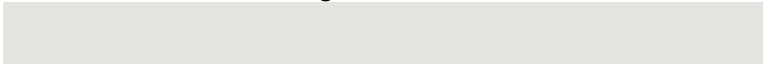




Large scale map



Large scale aerial





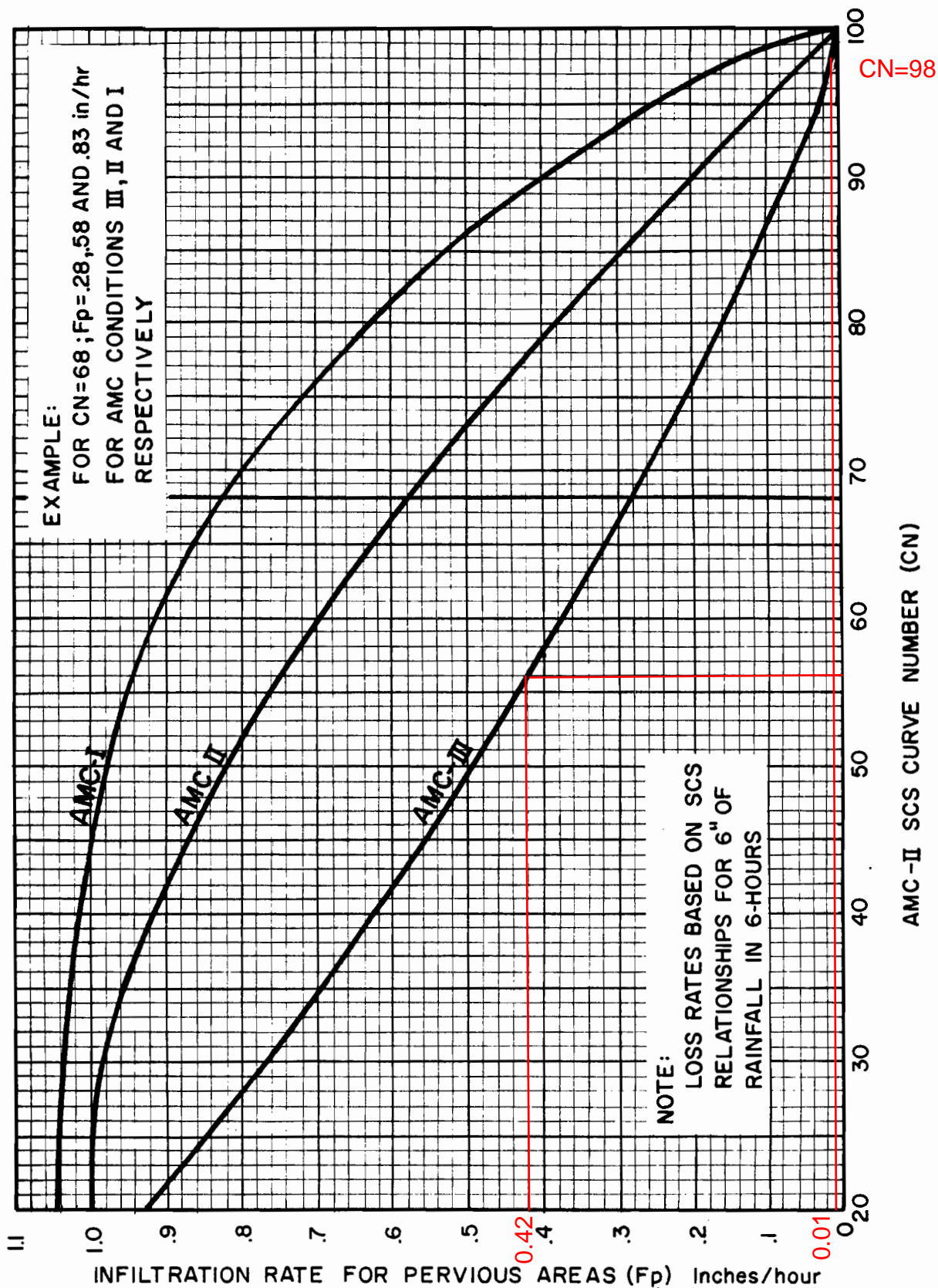
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## **Appendix 4: San Bernardino County Supplemental Figures**





**SAN BERNARDINO COUNTY**  
**HYDROLOGY MANUAL**

**INFILTRATION RATE FOR  
PERVIOUS AREAS VERSUS  
SCS CURVE NUMBERS**

## **Appendix 5: Calculations**

# Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

1 - Existing - OVERALL



2 - Proposed - DA-1



4 - Proposed - DA-2



3 - BLEEDOFF PIPE - 1



6 - Proposed - DA-3



5 - BLEEDOFF PIPE - 2







# Hydrograph Report

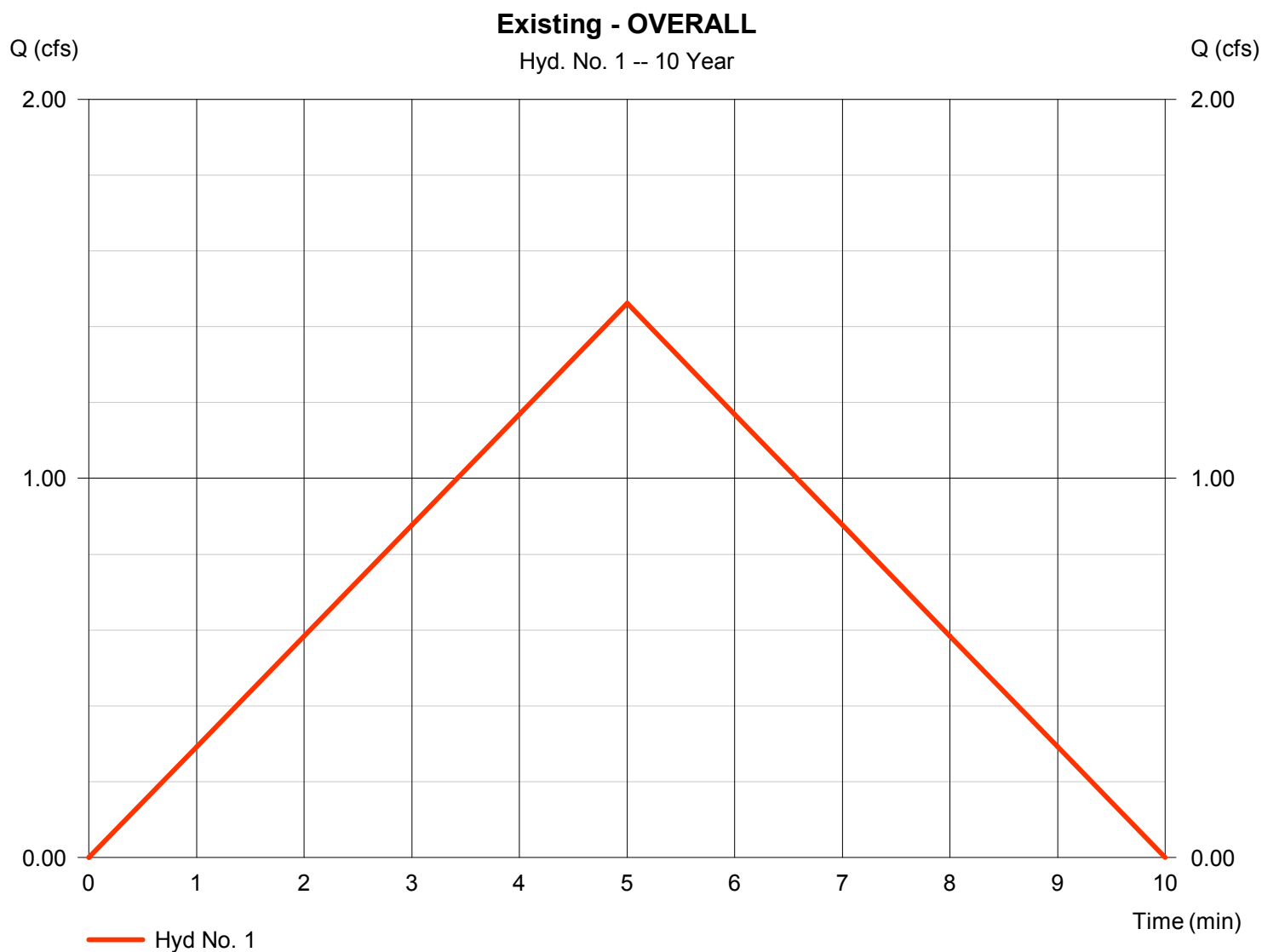
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Wednesday, 08 / 12 / 2015

## Hyd. No. 1

Existing - OVERALL

Hydrograph type	= Rational	Peak discharge	= 1.461 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 438 cuft
Drainage area	= 0.952 ac	Runoff coeff.	= 0.7
Intensity	= 2.193 in/hr	Tc by User	= 5.00 min
IDF Curve	= Pinon Hills.IDF	Asc/Rec limb fact	= 1/1

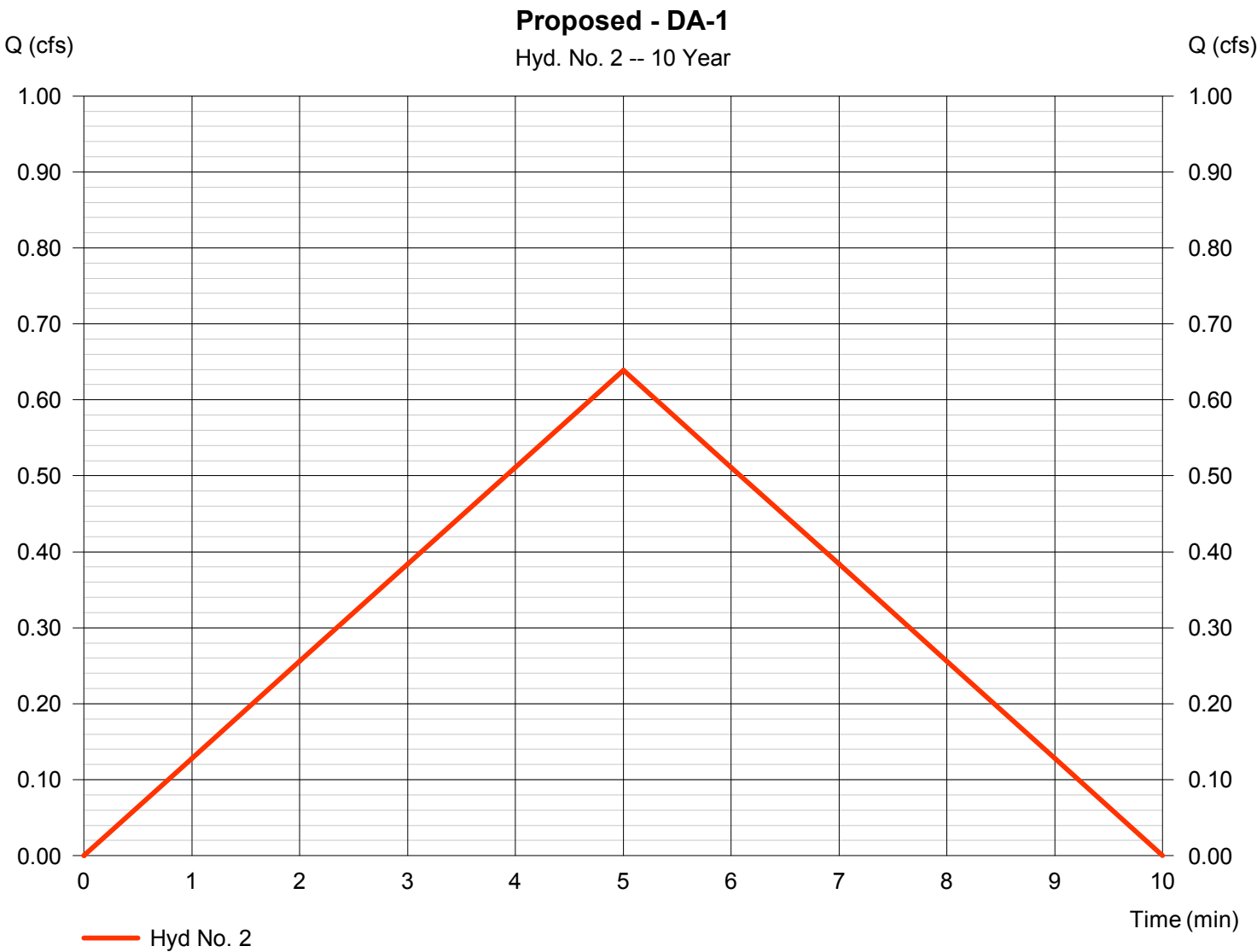


# Hydrograph Report

## Hyd. No. 2

Proposed - DA-1

Hydrograph type	= Rational	Peak discharge	= 0.639 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 192 cuft
Drainage area	= 0.307 ac	Runoff coeff.	= 0.95
Intensity	= 2.193 in/hr	Tc by User	= 5.00 min
IDF Curve	= Pinon Hills.IDF	Asc/Rec limb fact	= 1/1



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

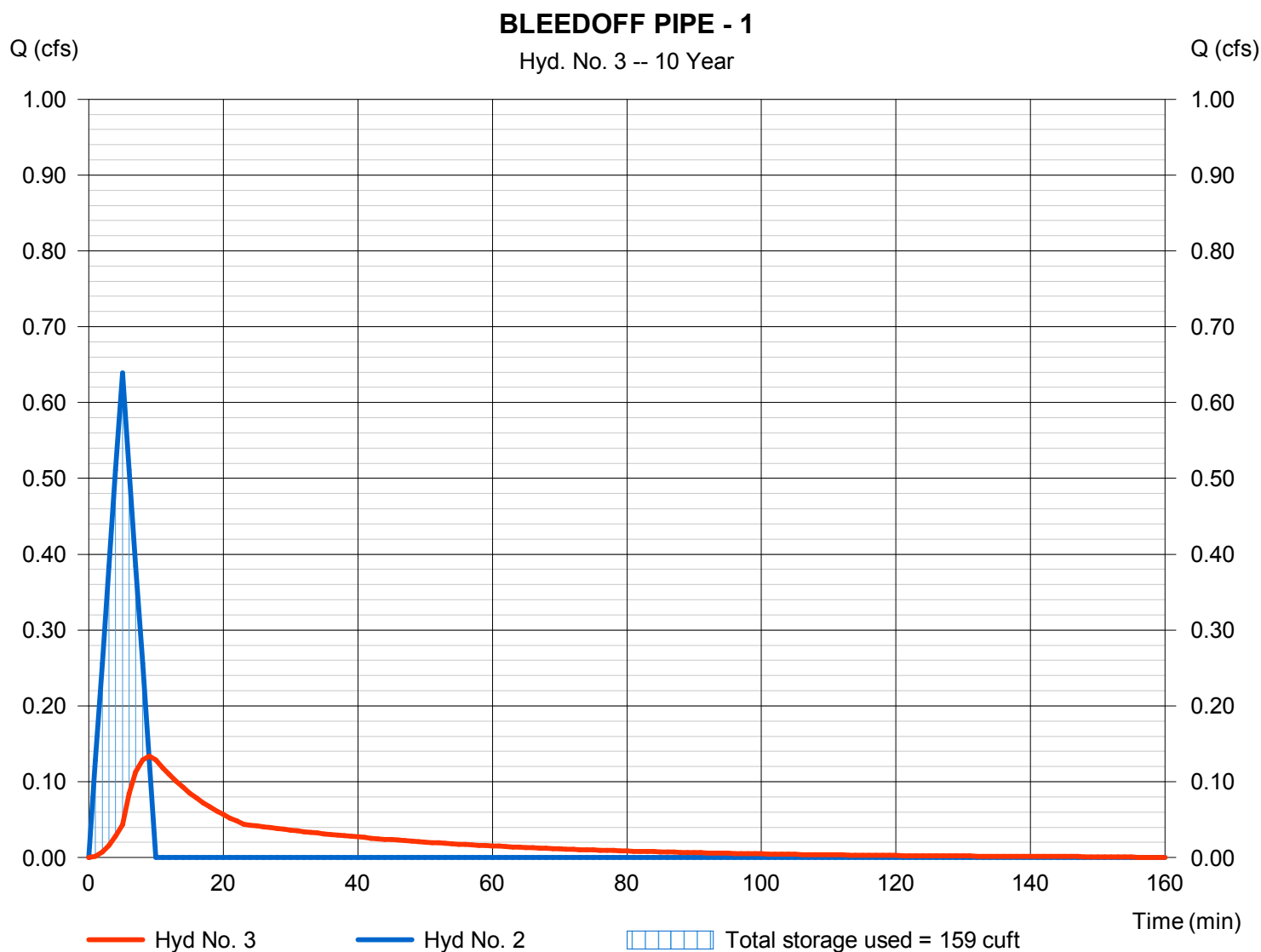
Wednesday, 08 / 12 / 2015

## Hyd. No. 3

### BLEEDOFF PIPE - 1

Hydrograph type	= Reservoir	Peak discharge	= 0.134 cfs
Storm frequency	= 10 yrs	Time to peak	= 9 min
Time interval	= 1 min	Hyd. volume	= 190 cuft
Inflow hyd. No.	= 2 - Proposed - DA-1	Max. Elevation	= 100.17 ft
Reservoir name	= POND-1	Max. Storage	= 159 cuft

Storage Indication method used.



# Pond Report

## Pond No. 1 - POND-1

### Pond Data

**Contours** -User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 100.00 ft

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	686	0	0
1.00	101.00	1,192	928	928

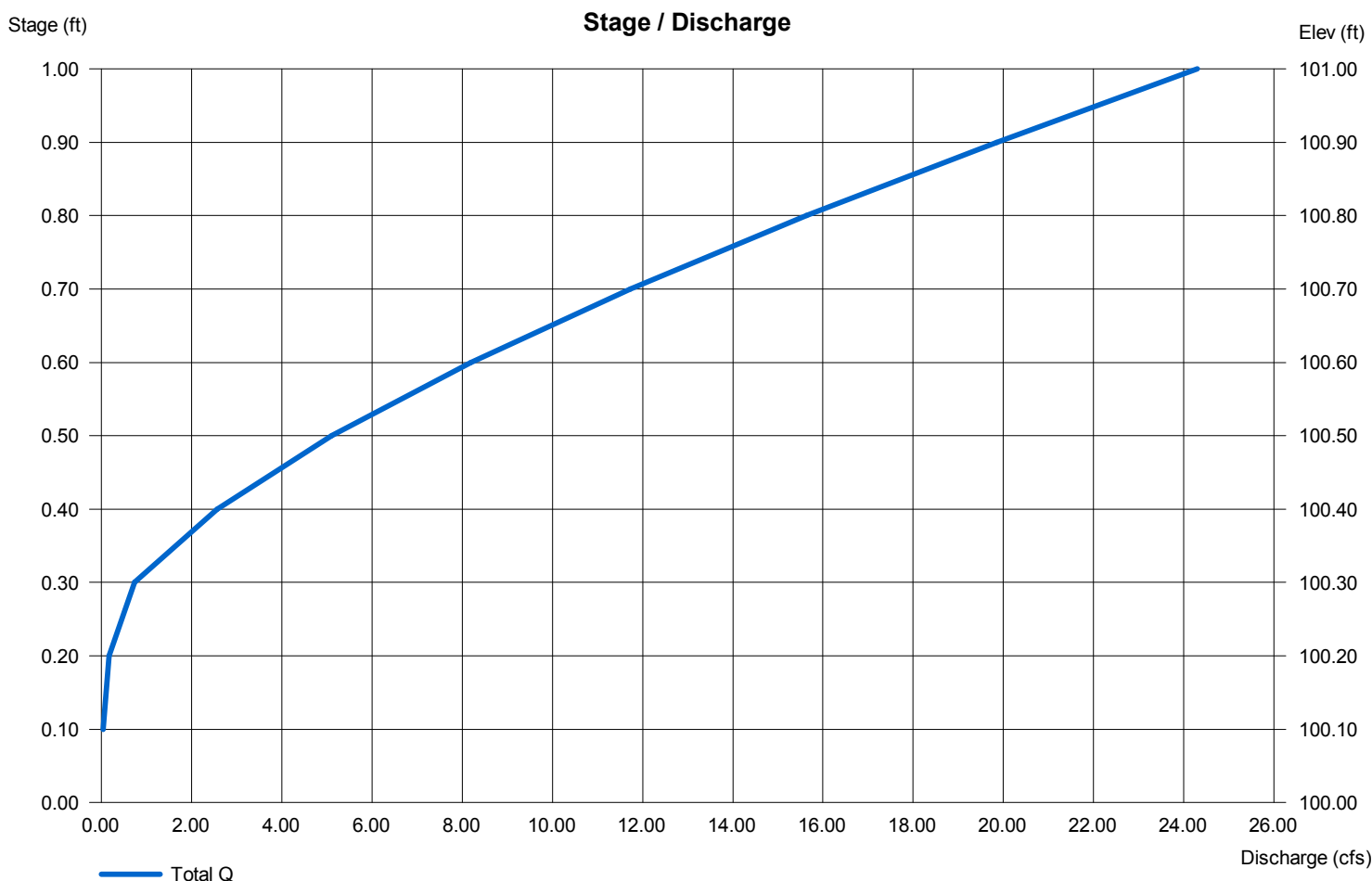
### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 100.00	0.00	0.00	0.00
Length (ft)	= 21.00	0.00	0.00	0.00
Slope (%)	= 14.29	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 100.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Cipiti	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).





# Hydrograph Report

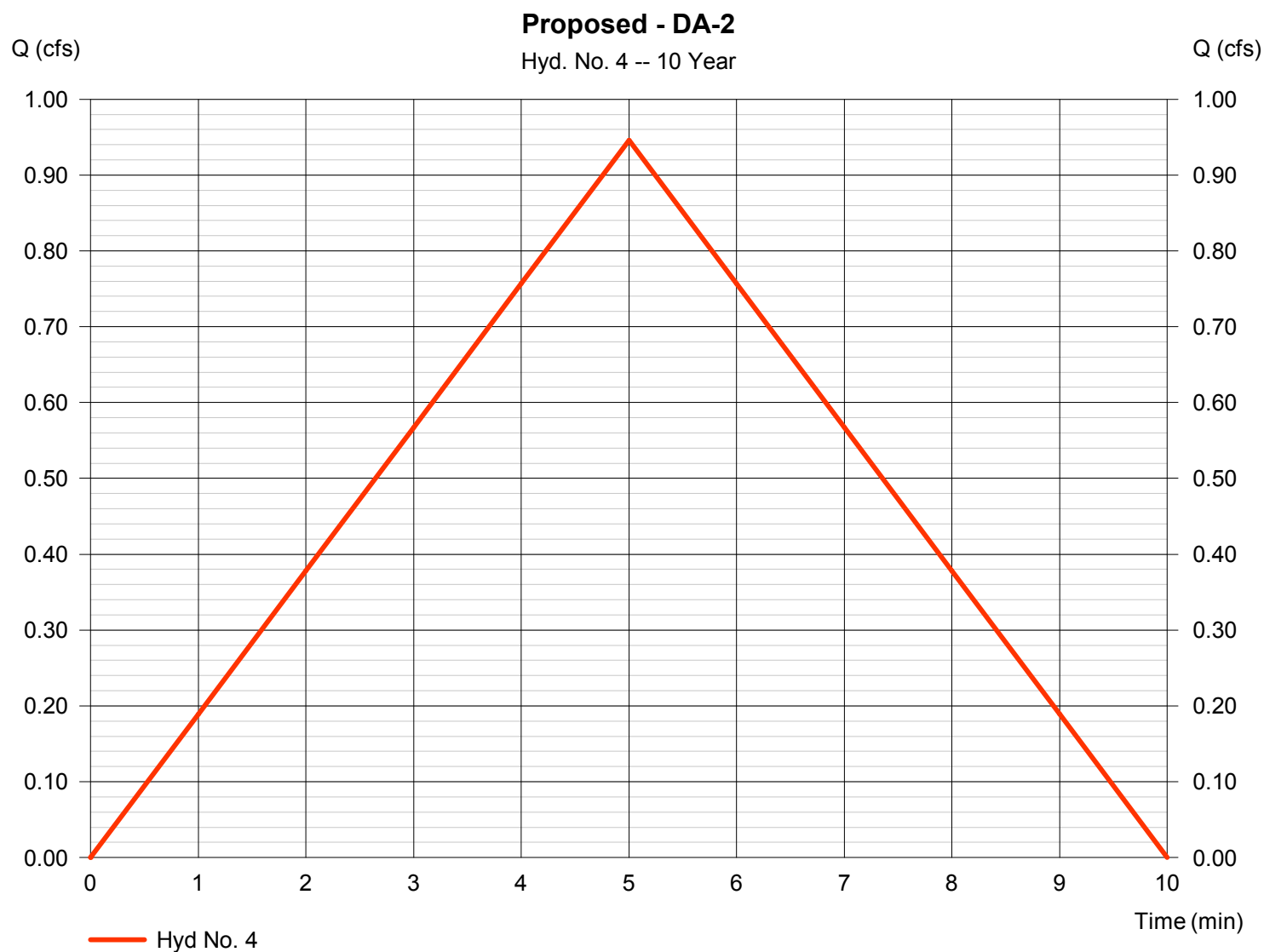
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Wednesday, 08 / 12 / 2015

## Hyd. No. 4

Proposed - DA-2

Hydrograph type	= Rational	Peak discharge	= 0.946 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 284 cuft
Drainage area	= 0.454 ac	Runoff coeff.	= 0.95
Intensity	= 2.193 in/hr	Tc by User	= 5.00 min
IDF Curve	= Pinon Hills.IDF	Asc/Rec limb fact	= 1/1



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

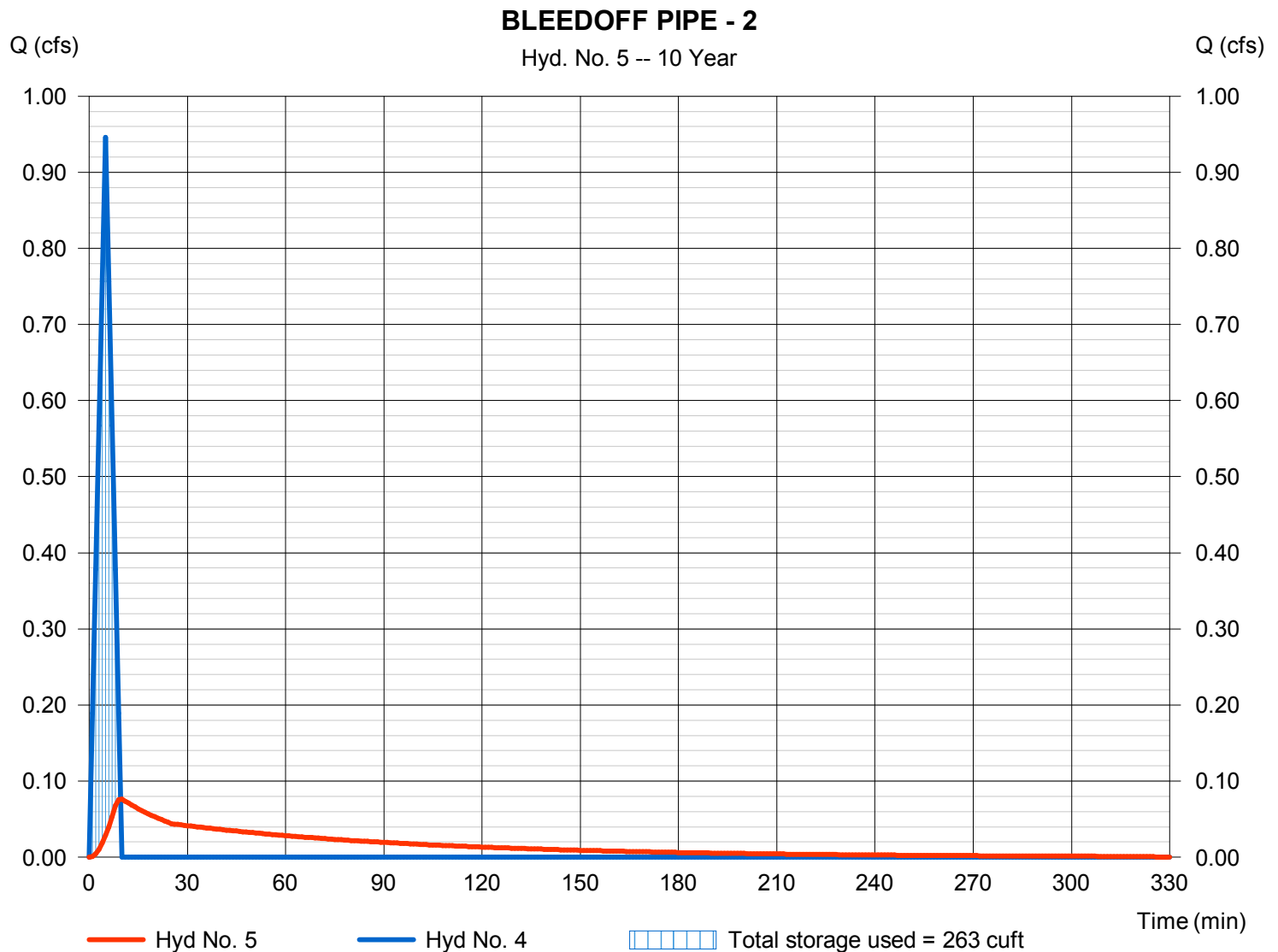
Wednesday, 08 / 12 / 2015

## Hyd. No. 5

### BLEEDOFF PIPE - 2

Hydrograph type	= Reservoir	Peak discharge	= 0.076 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 279 cuft
Inflow hyd. No.	= 4 - Proposed - DA-2	Max. Elevation	= 100.13 ft
Reservoir name	= POND-2	Max. Storage	= 263 cuft

Storage Indication method used.



# Pond Report

9

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Wednesday, 08 / 12 / 2015

## Pond No. 2 - POND-2

### Pond Data

**Contours** -User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 100.00 ft

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	2,989	0	0
1.00	101.00	1,323	2,100	2,100

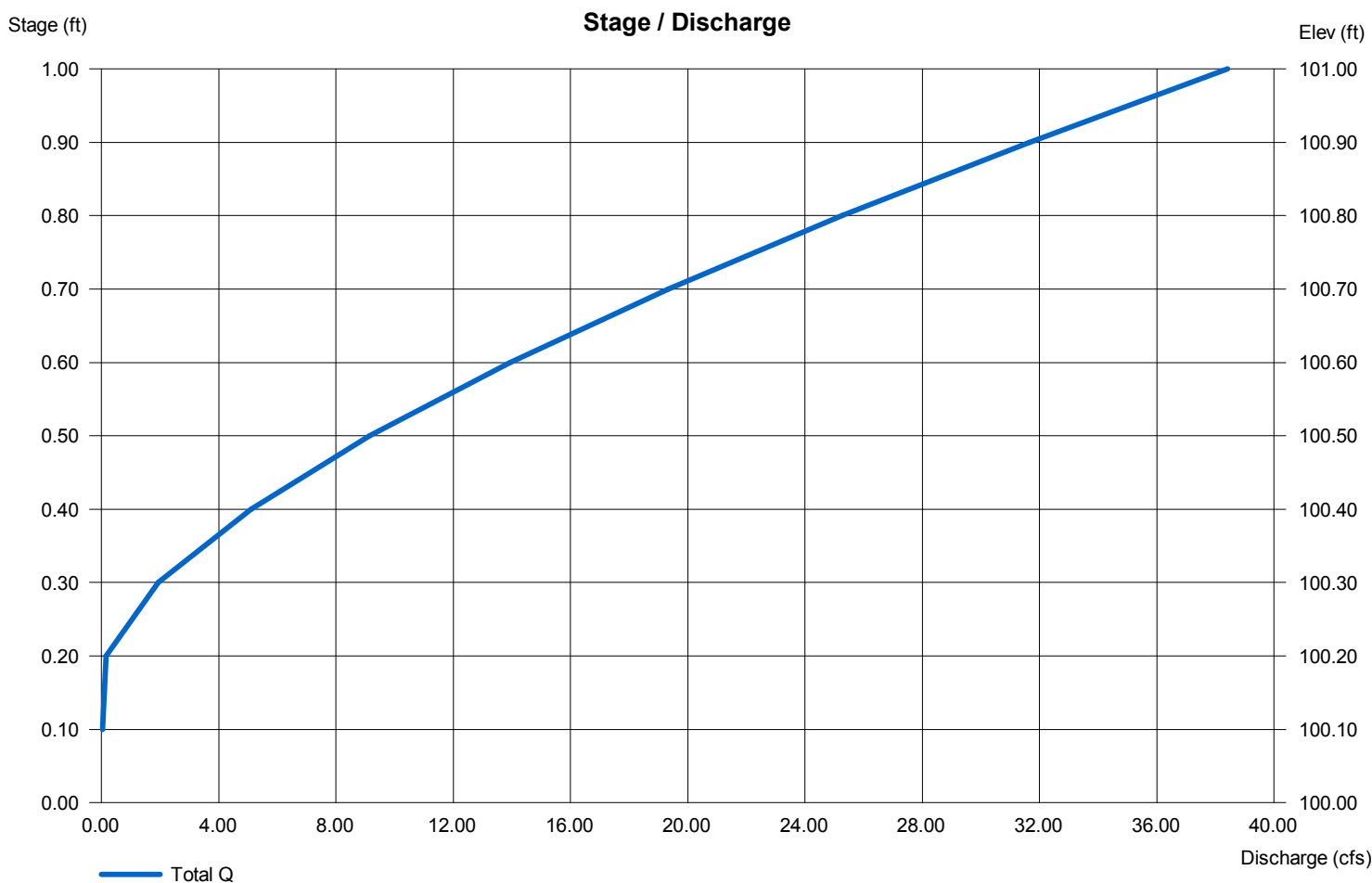
### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 100.00	0.00	0.00	0.00
Length (ft)	= 29.80	0.00	0.00	0.00
Slope (%)	= 3.36	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.00	0.00	0.00	0.00
Crest El. (ft)	= 100.20	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Cipiti	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



# Hydrograph Report

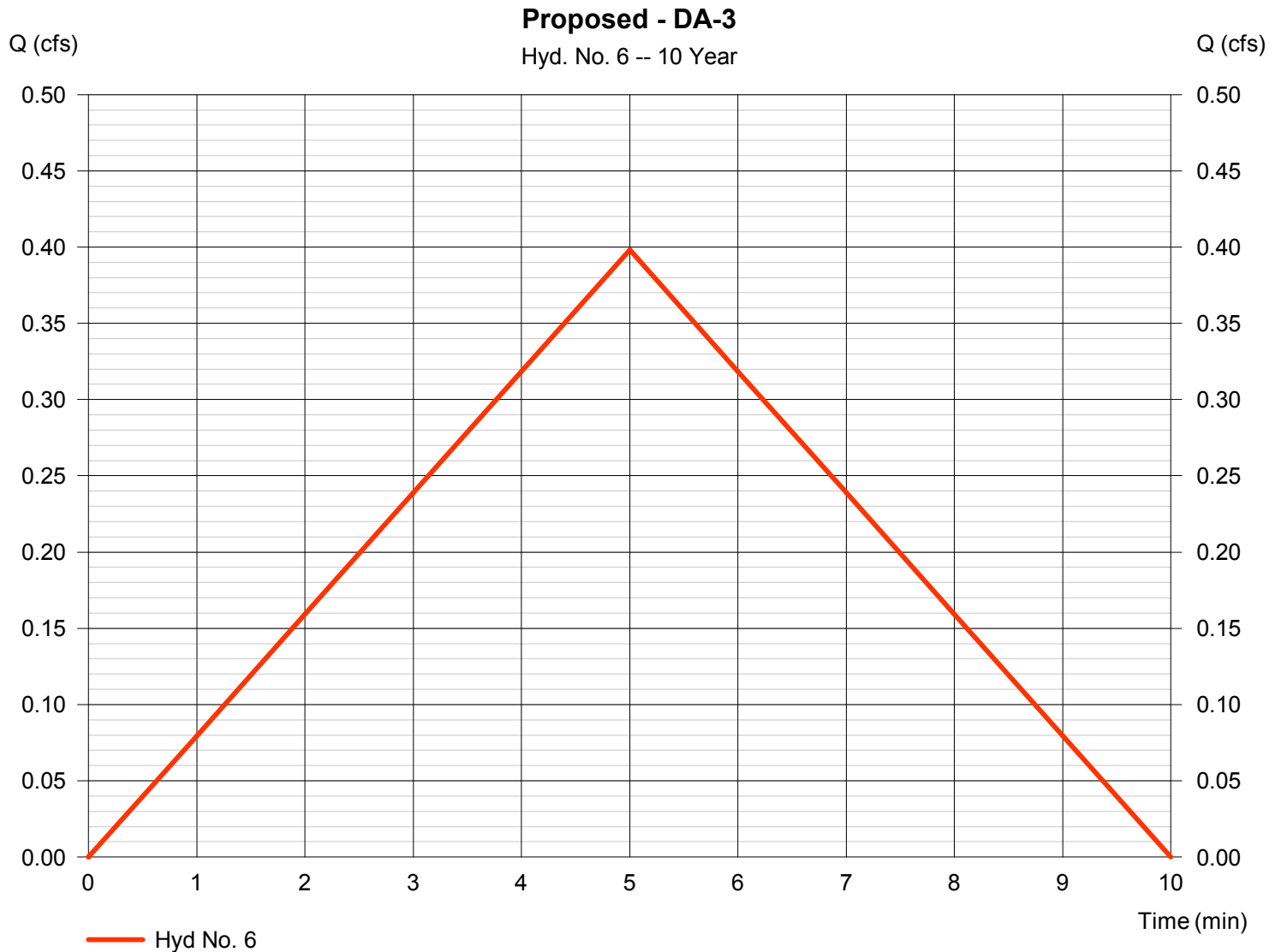
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 6

Proposed - DA-3

Hydrograph type	= Rational	Peak discharge	= 0.398 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 119 cuft
Drainage area	= 0.191 ac	Runoff coeff.	= 0.95
Intensity	= 2.193 in/hr	Tc by User	= 5.00 min
IDF Curve	= Pinon Hills.IDF	Asc/Rec limb fact	= 1/1



# Hydrograph Report

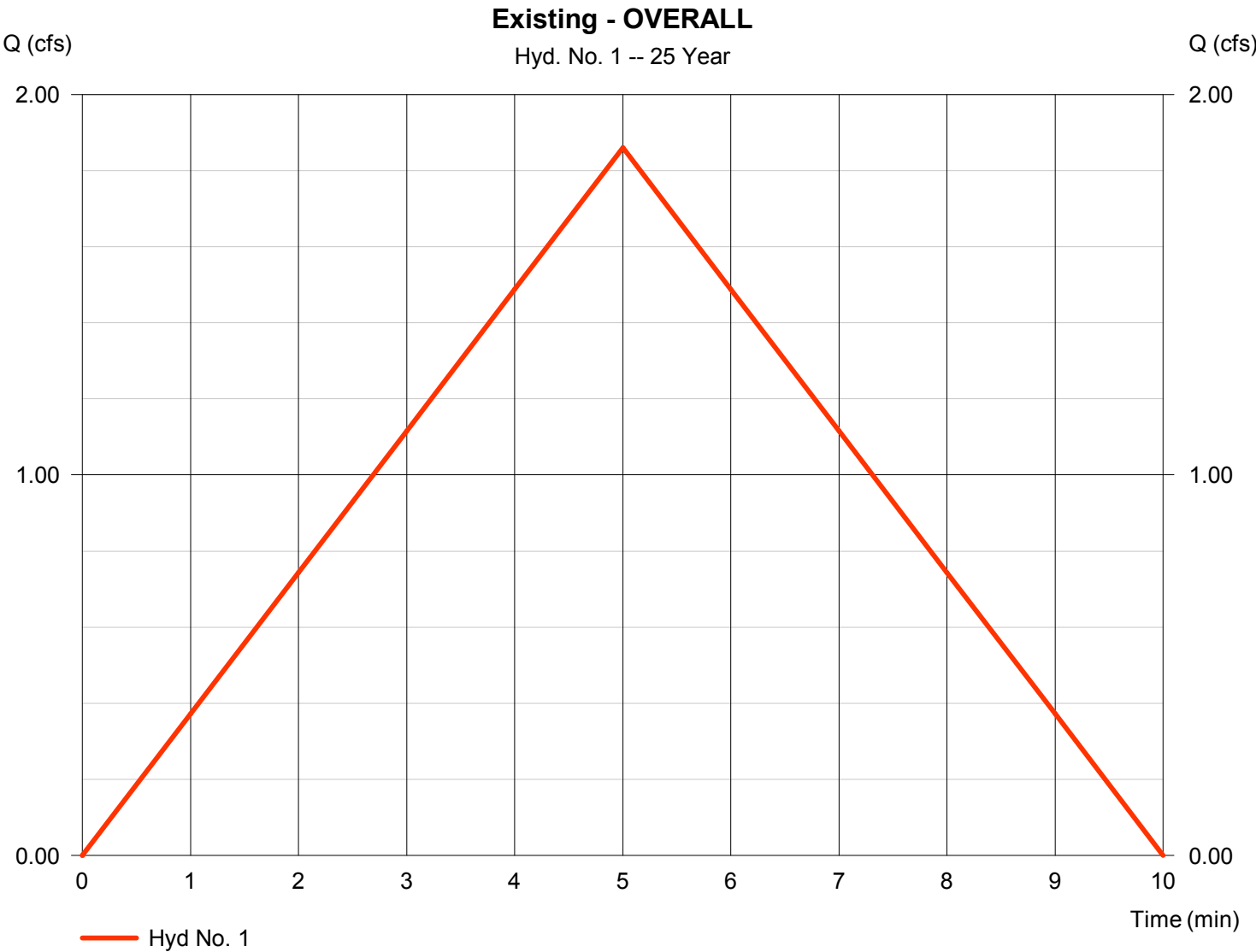
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 1

Existing - OVERALL

Hydrograph type	= Rational	Peak discharge	= 1.860 cfs
Storm frequency	= 25 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 558 cuft
Drainage area	= 0.952 ac	Runoff coeff.	= 0.7
Intensity	= 2.792 in/hr	Tc by User	= 5.00 min
IDF Curve	= Pinon Hills.IDF	Asc/Rec limb fact	= 1/1





# Hydrograph Report

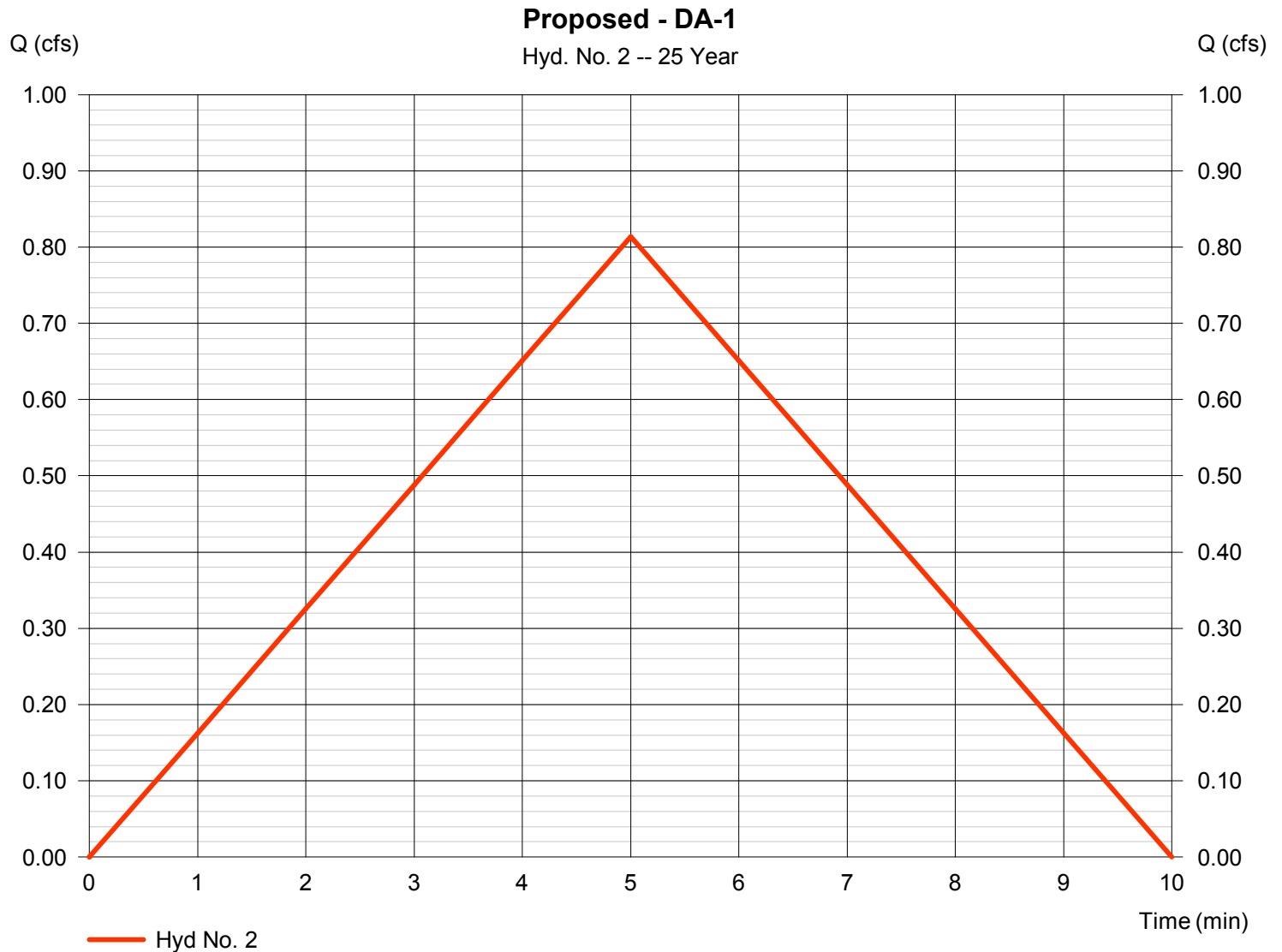
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 2

Proposed - DA-1

Hydrograph type	= Rational	Peak discharge	= 0.814 cfs
Storm frequency	= 25 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 244 cuft
Drainage area	= 0.307 ac	Runoff coeff.	= 0.95
Intensity	= 2.792 in/hr	Tc by User	= 5.00 min
IDF Curve	= Pinon Hills.IDF	Asc/Rec limb fact	= 1/1



# Hydrograph Report

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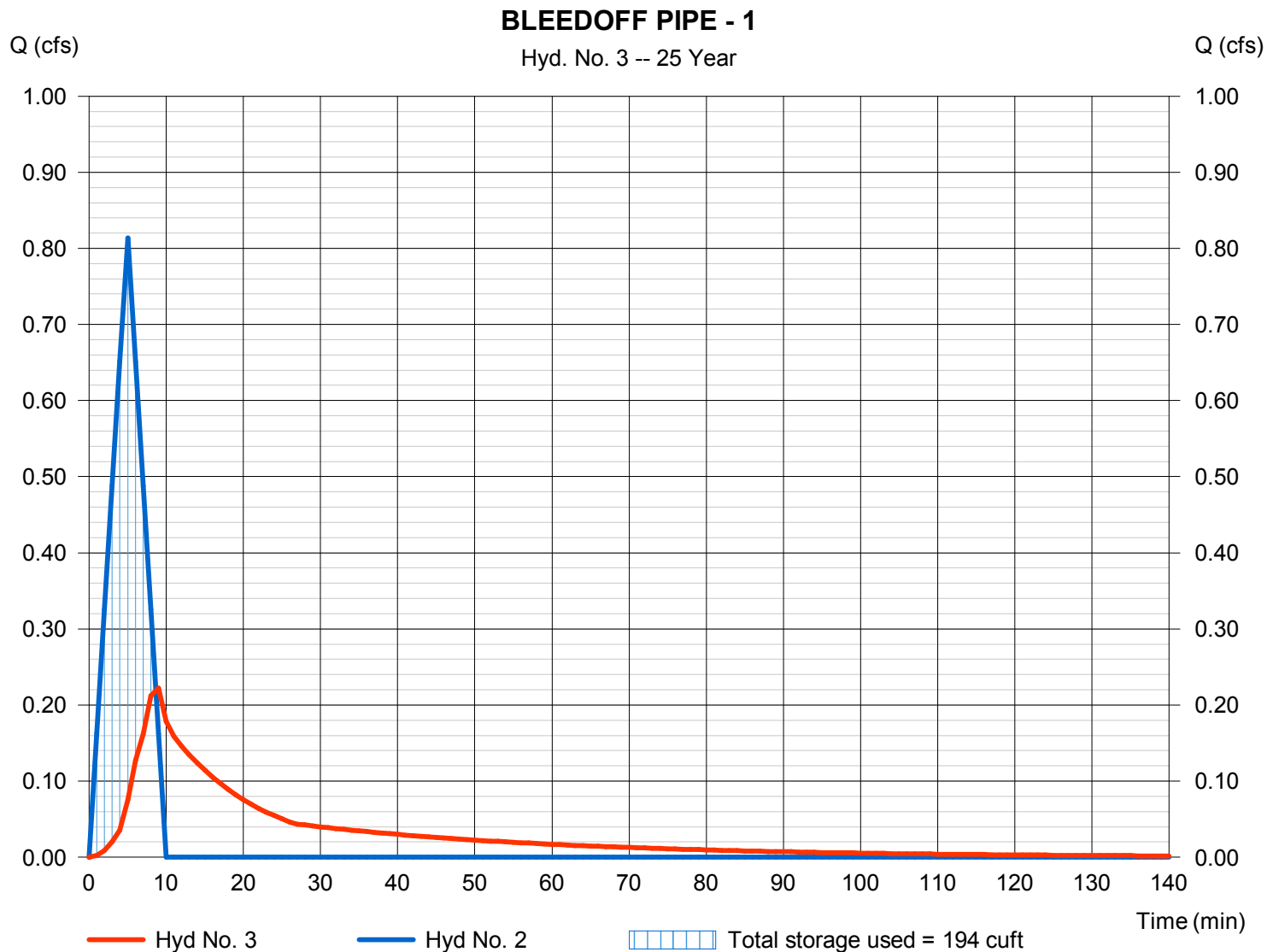
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## Hyd. No. 3

### BLEEDOFF PIPE - 1

Hydrograph type	= Reservoir	Peak discharge	= 0.222 cfs
Storm frequency	= 25 yrs	Time to peak	= 9 min
Time interval	= 1 min	Hyd. volume	= 242 cuft
Inflow hyd. No.	= 2 - Proposed - DA-1	Max. Elevation	= 100.21 ft
Reservoir name	= POND-1	Max. Storage	= 194 cuft

Storage Indication method used.



# Hydrograph Report

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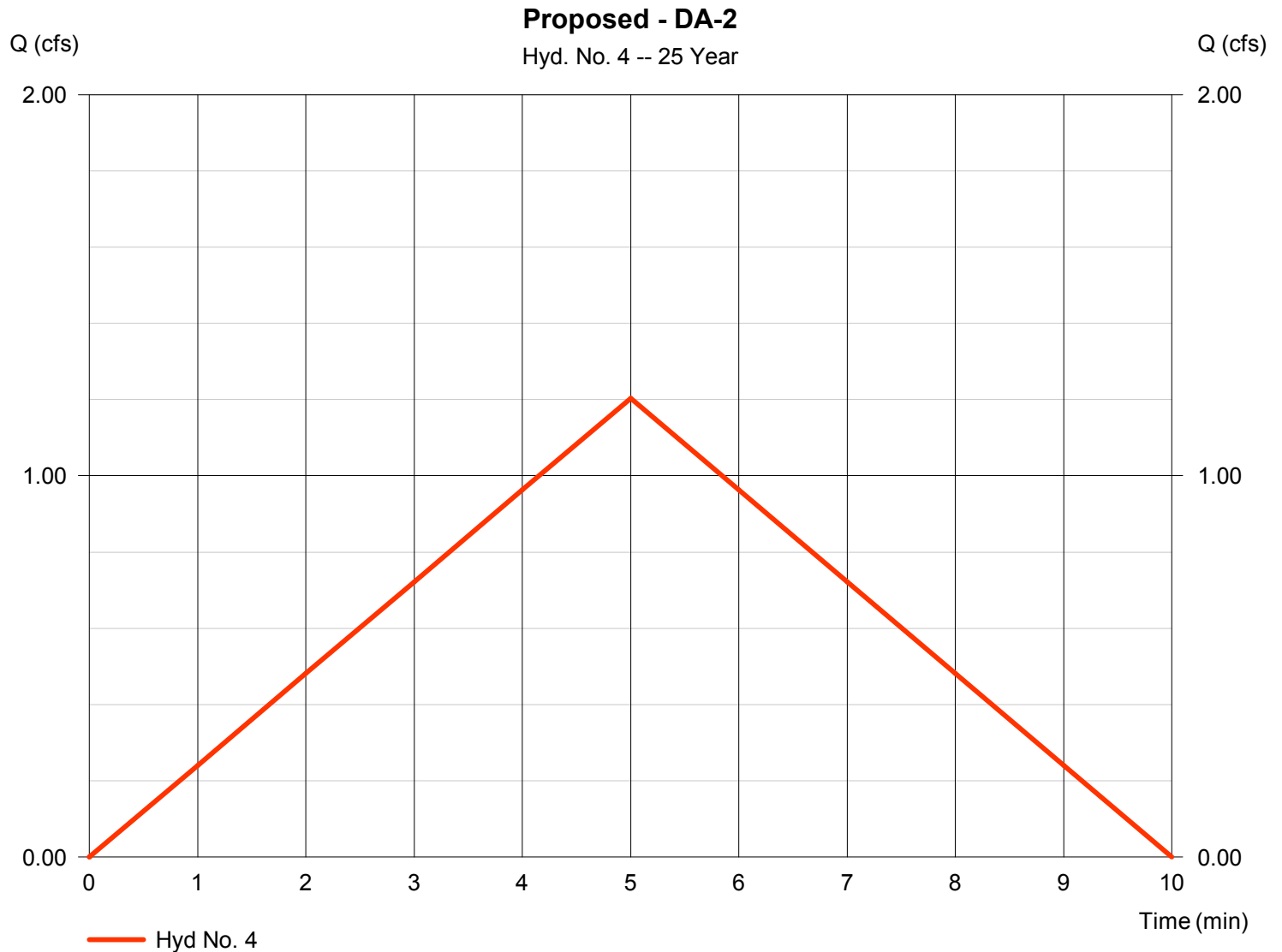
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## Hyd. No. 4

Proposed - DA-2

Hydrograph type = Rational  
 Storm frequency = 25 yrs  
 Time interval = 1 min  
 Drainage area = 0.454 ac  
 Intensity = 2.792 in/hr  
 IDF Curve = Pinon Hills.IDF

Peak discharge = 1.204 cfs  
 Time to peak = 5 min  
 Hyd. volume = 361 cuft  
 Runoff coeff. = 0.95  
 Tc by User = 5.00 min  
 Asc/Rec limb fact = 1/1



# Hydrograph Report

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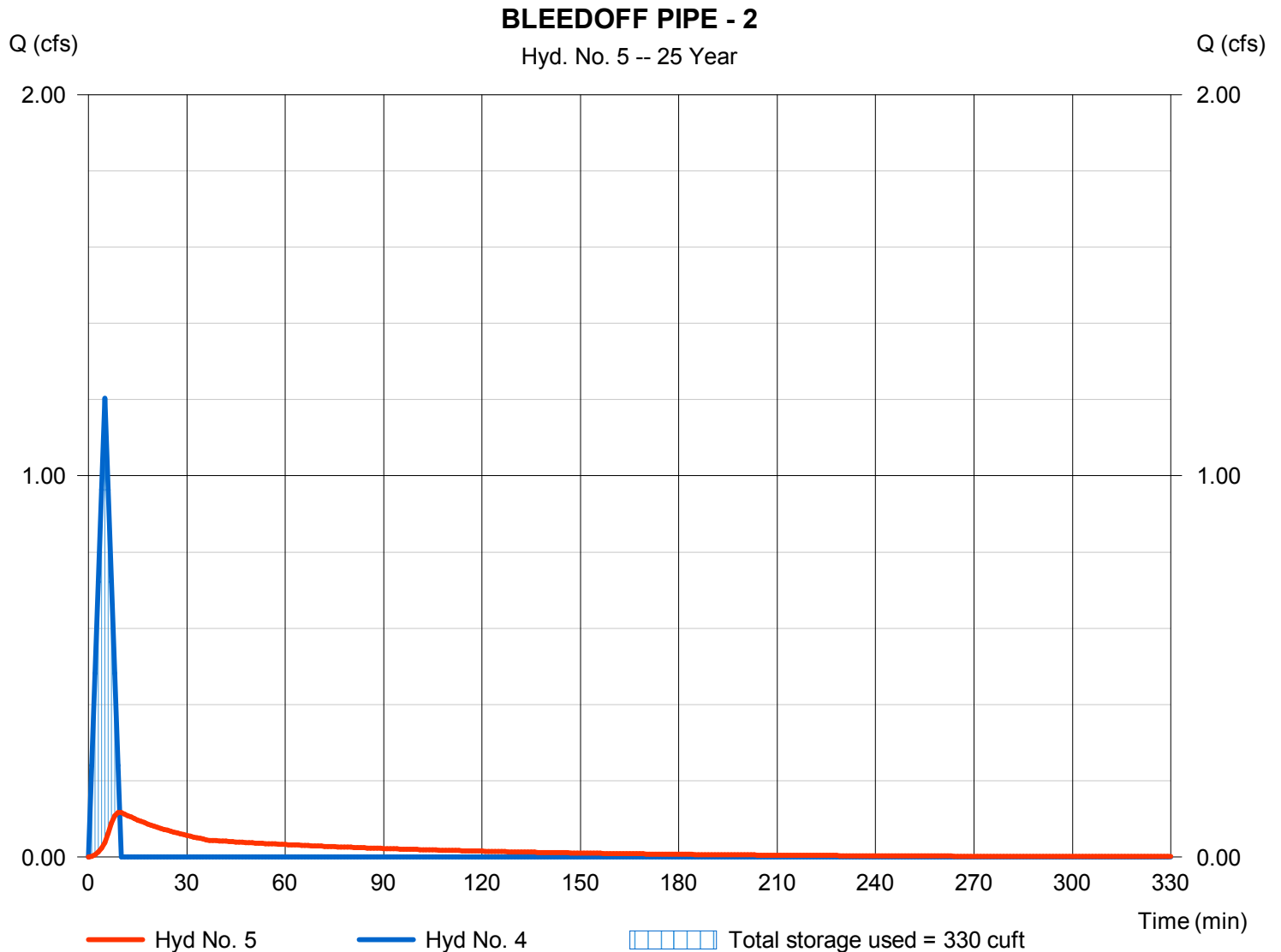
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## Hyd. No. 5

### BLEEDOFF PIPE - 2

Hydrograph type	= Reservoir	Peak discharge	= 0.117 cfs
Storm frequency	= 25 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 356 cuft
Inflow hyd. No.	= 4 - Proposed - DA-2	Max. Elevation	= 100.16 ft
Reservoir name	= POND-2	Max. Storage	= 330 cuft

Storage Indication method used.



# Hydrograph Report

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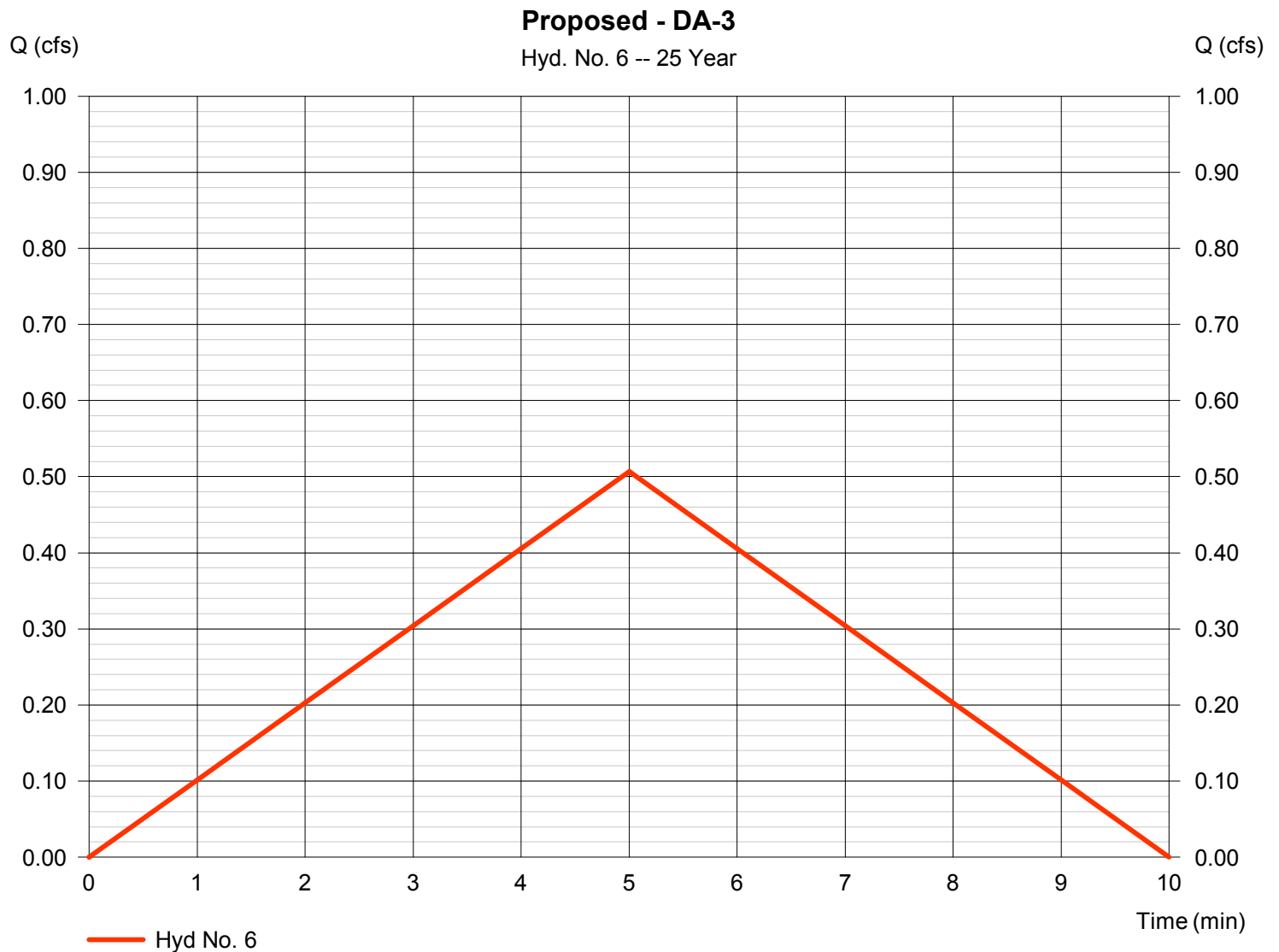
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## Hyd. No. 6

Proposed - DA-3

Hydrograph type = Rational  
 Storm frequency = 25 yrs  
 Time interval = 1 min  
 Drainage area = 0.191 ac  
 Intensity = 2.792 in/hr  
 IDF Curve = Pinon Hills.IDF

Peak discharge = 0.507 cfs  
 Time to peak = 5 min  
 Hyd. volume = 152 cuft  
 Runoff coeff. = 0.95  
 Tc by User = 5.00 min  
 Asc/Rec limb fact = 1/1





# Hydrograph Report

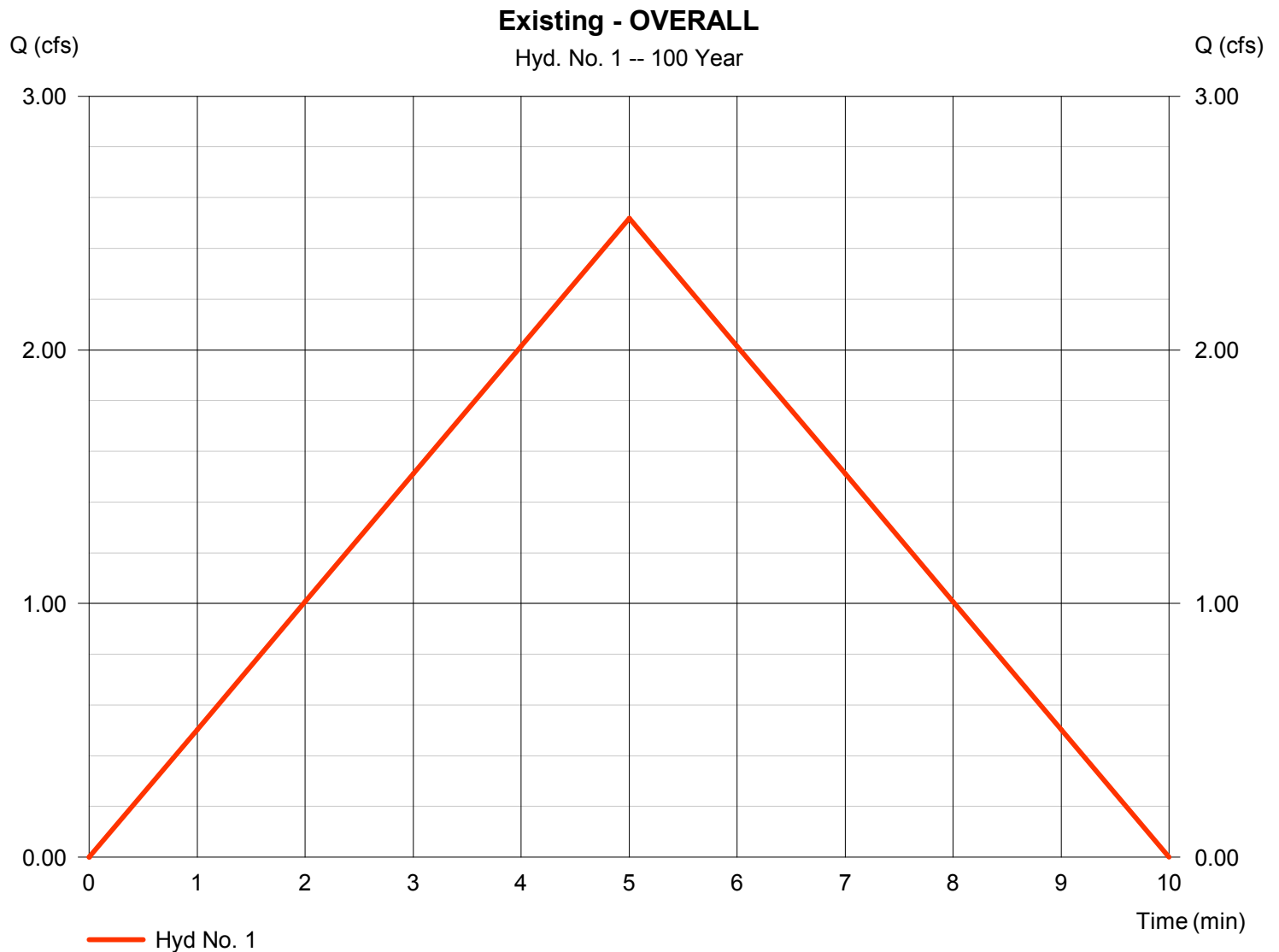
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## Hyd. No. 1

Existing - OVERALL

Hydrograph type	= Rational	Peak discharge	= 2.519 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 756 cuft
Drainage area	= 0.952 ac	Runoff coeff.	= 0.7
Intensity	= 3.780 in/hr	Tc by User	= 5.00 min
IDF Curve	= Pinon Hills.IDF	Asc/Rec limb fact	= 1/1



# Hydrograph Report

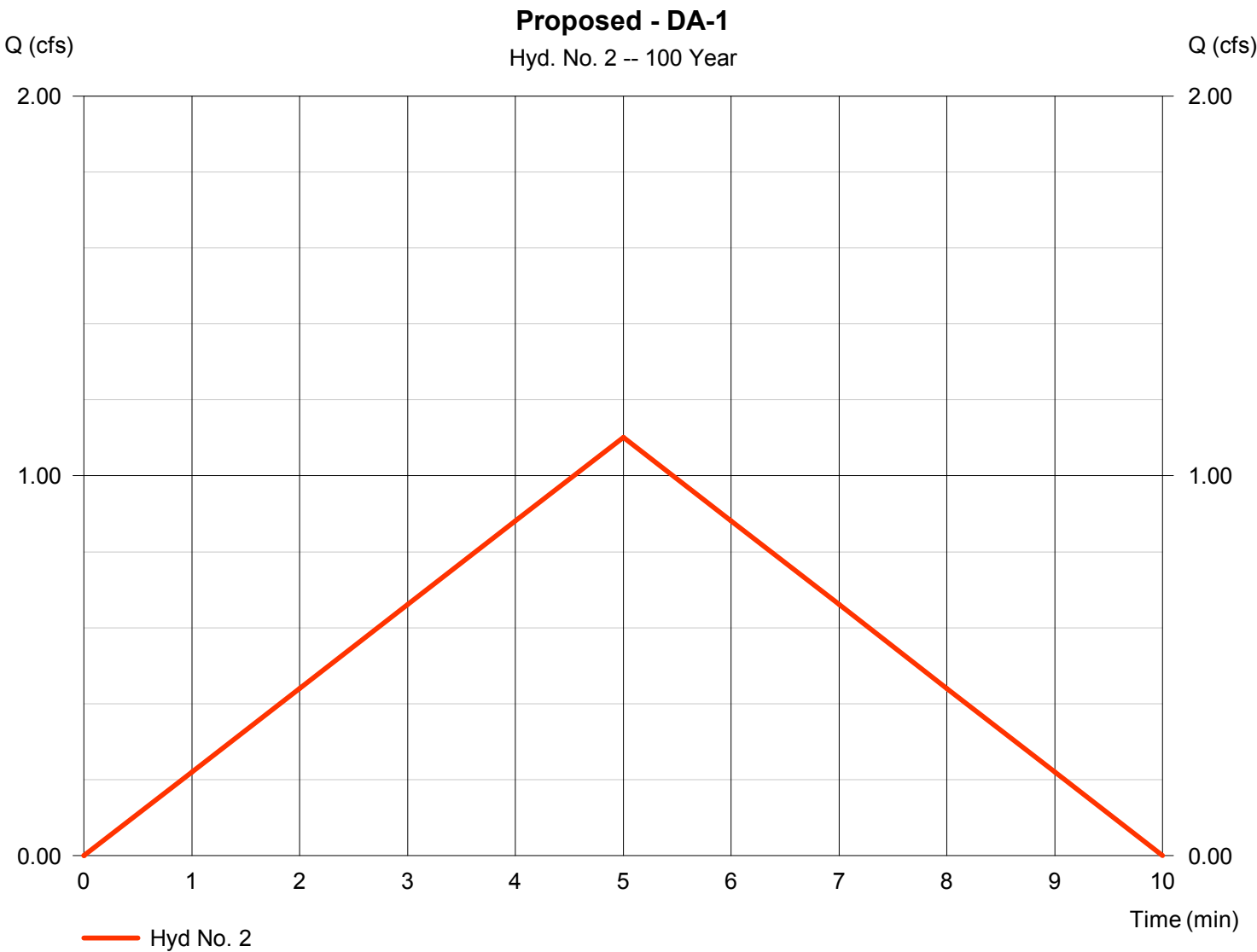
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## Hyd. No. 2

Proposed - DA-1

Hydrograph type	= Rational	Peak discharge	= 1.102 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 331 cuft
Drainage area	= 0.307 ac	Runoff coeff.	= 0.95
Intensity	= 3.780 in/hr	Tc by User	= 5.00 min
IDF Curve	= Pinon Hills.IDF	Asc/Rec limb fact	= 1/1



# Hydrograph Report

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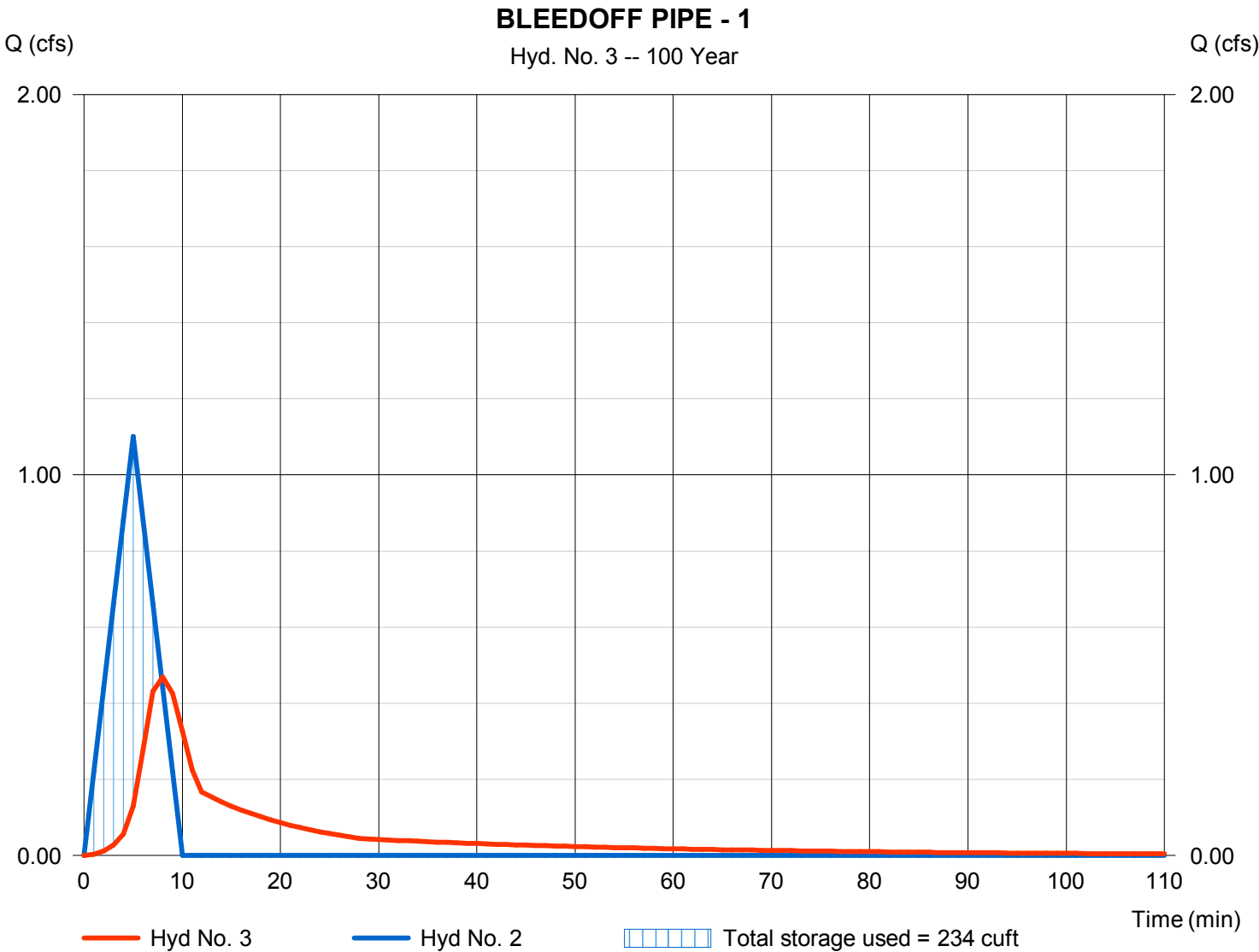
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## Hyd. No. 3

### BLEEDOFF PIPE - 1

Hydrograph type	= Reservoir	Peak discharge	= 0.469 cfs
Storm frequency	= 100 yrs	Time to peak	= 8 min
Time interval	= 1 min	Hyd. volume	= 328 cuft
Inflow hyd. No.	= 2 - Proposed - DA-1	Max. Elevation	= 100.25 ft
Reservoir name	= POND-1	Max. Storage	= 234 cuft

Storage Indication method used.



# Hydrograph Report

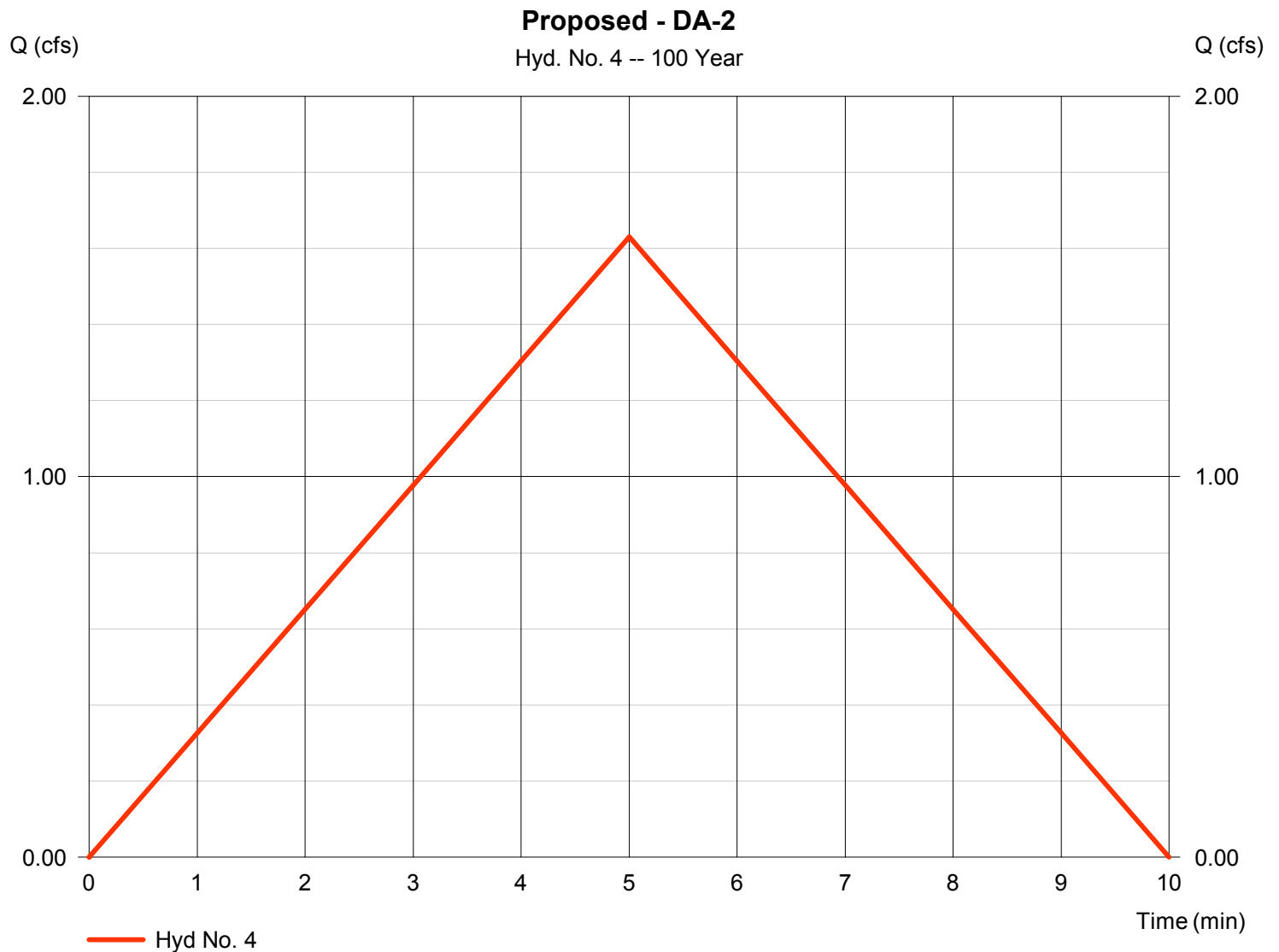
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## Hyd. No. 4

Proposed - DA-2

Hydrograph type	= Rational	Peak discharge	= 1.630 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 489 cuft
Drainage area	= 0.454 ac	Runoff coeff.	= 0.95
Intensity	= 3.780 in/hr	Tc by User	= 5.00 min
IDF Curve	= Pinon Hills.IDF	Asc/Rec limb fact	= 1/1



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

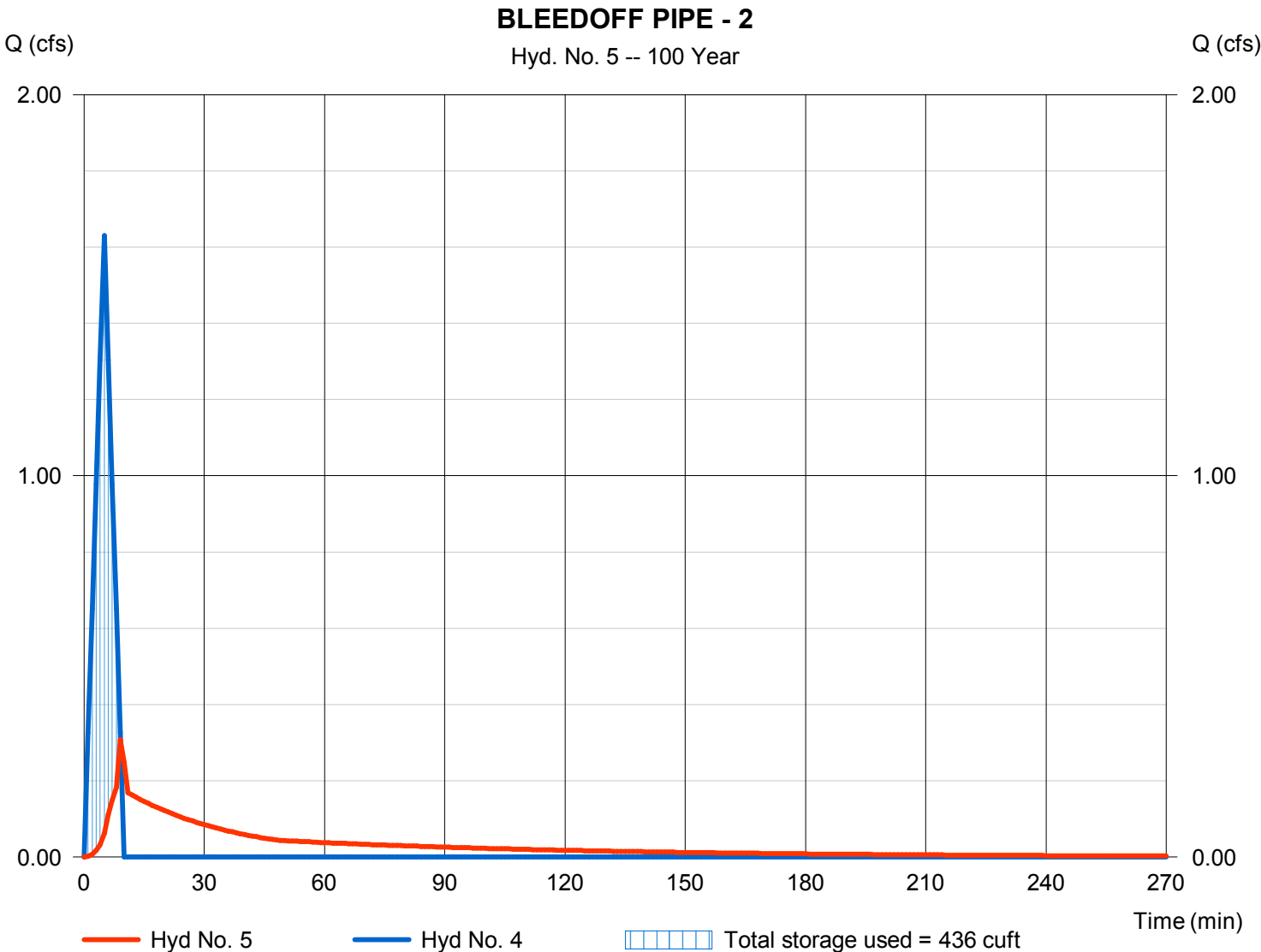
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## Hyd. No. 5

### BLEEDOFF PIPE - 2

Hydrograph type	= Reservoir	Peak discharge	= 0.307 cfs
Storm frequency	= 100 yrs	Time to peak	= 9 min
Time interval	= 1 min	Hyd. volume	= 484 cuft
Inflow hyd. No.	= 4 - Proposed - DA-2	Max. Elevation	= 100.21 ft
Reservoir name	= POND-2	Max. Storage	= 436 cuft

Storage Indication method used.





# Hydrograph Report

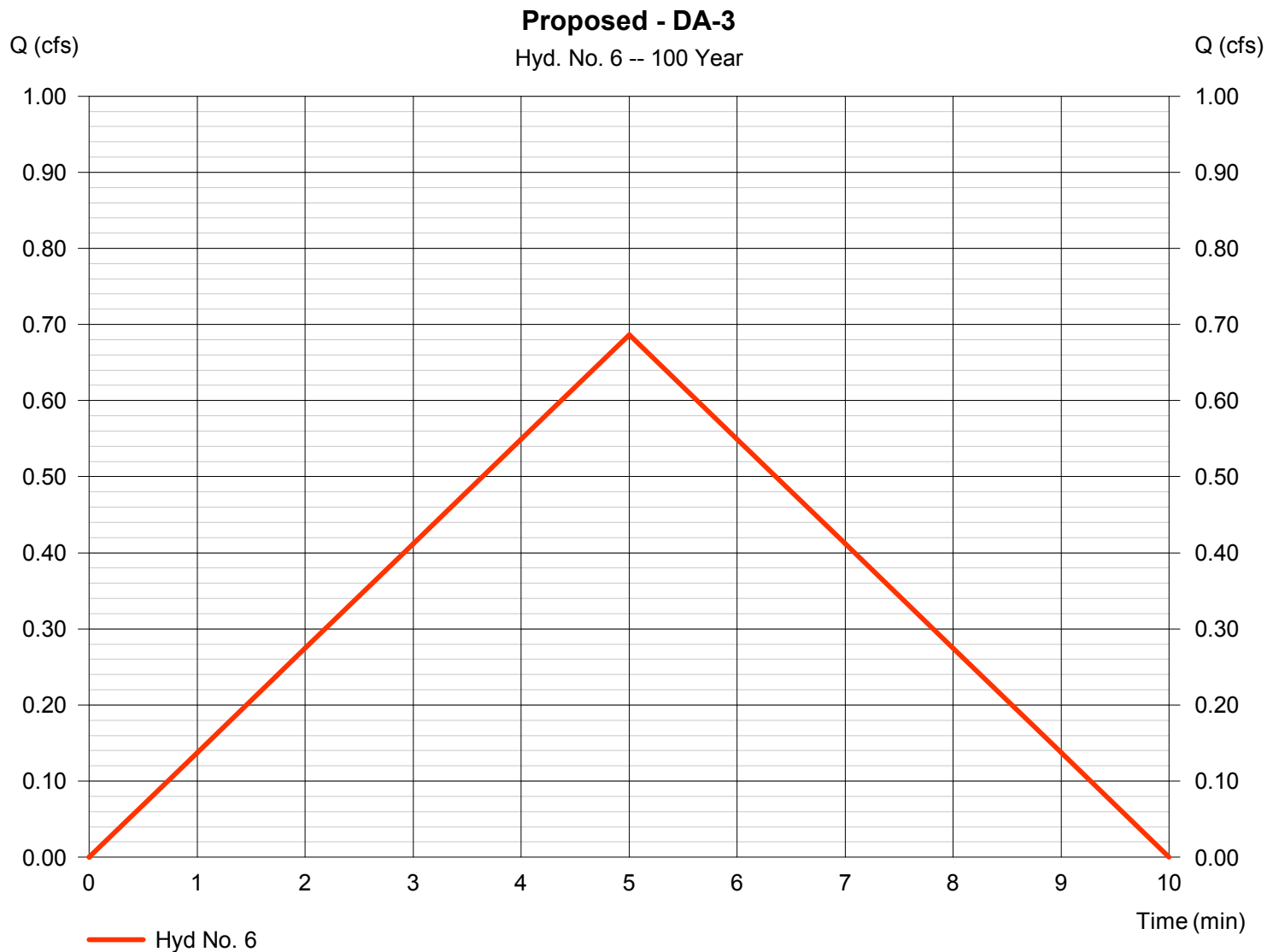
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## Hyd. No. 6

Proposed - DA-3

Hydrograph type	= Rational	Peak discharge	= 0.686 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 206 cuft
Drainage area	= 0.191 ac	Runoff coeff.	= 0.95
Intensity	= 3.780 in/hr	Tc by User	= 5.00 min
IDF Curve	= Pinon Hills.IDF	Asc/Rec limb fact	= 1/1





# Channel Report

## PROPOSED DRAINAGE SWALE

### Triangular

Side Slopes (z:1) = 2.00, 2.00  
Total Depth (ft) = 1.00

Invert Elev (ft) = 100.00  
Slope (%) = 1.50  
N-Value = 0.040

### Calculations

Compute by: Q vs Depth  
No. Increments = 10

### Highlighted

Depth (ft) = 1.00  
Q (cfs) = 5.320  
Area (sqft) = 2.00  
Velocity (ft/s) = 2.66  
Wetted Perim (ft) = 4.47  
Crit Depth, Yc (ft) = 0.85  
Top Width (ft) = 4.00  
EGL (ft) = 1.11

